ecoGEO B

ecoGEO B1 3-12 kW

ecoGEO B2 3-12 kW

ecoGEO B3 3-12 kW

ecoGEO B1 5-22 kW

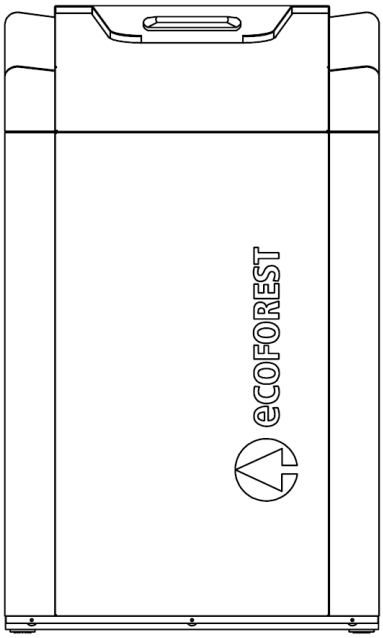
ecoGEO B2 5-22 kW

ecoGEO B3 5-22 kW

ecoGEO B1 T 5-22 kW

ecoGEO B2 T 5-22 kW

ecoGEO B3 T 5-22 kW



Installation and User Manual

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1. GENERAL INFORMATION

Thank you for purchasing the ECOFOREST ecoGEO heat pump.

In this manual, you will find information about the installation, commissioning, maintenance and troubleshooting of the equipment. It also includes useful information for the end user, such as navigating and adjusting parameters using the front panel.

In order to get the most benefit from your ecoGEO heat pump, please read this manual carefully before installing and commissioning the equipment. This manual should be kept for future reference.

In this manual you will find two different types of warning, as shown below; it is very important to pay special attention.

DANGER!

- Indicates an imminent or potentially hazardous situation which, if not avoided, could result in death or personal injury. It may also warn you about unsafe practices.

NOTE

- Indicates a situation which could result in property damage or equipment malfunction. It may also indicate whether the practice is the commendable for the equipment.

The coGEO heat pumps are intended for serving heating-cooling systems and producing domestic hot water (DHW). Any other application of the equipment could result in injuries and/or property damage or equipment malfunction. The manufacturer will not be liable for any property damage and/or injuries resulting from the inappropriate use of the equipment.

The heat pump should be installed by an authorized installer following the applicable local regulations and in accordance with the installation instructions set outlined this manual.

2. SAFETY ISSUES

The indications outlined in this section cover important issues on your safety; please follow them carefully.

DANGER!

- All installation and maintenance work must be performed by an authorized technician following the indications outlined in this manual.
- An improper installation or misuse of the equipment could result in electrical shock, short circuits, working fluid leakage, fire or other injuries and/or property damages. If you are unsure about the equipment installation, maintenance or operation procedures, please contact your local dealer or customer services for advice.
- If you detect unusual performance in the unit, please contact your local dealer or customer services to resolve your concerns.
- This equipment must not be operated by persons suffering any type of physical, sensorial or psychological disability, children or persons lacking the necessary experience or knowledge, unless they have been given supervision or instruction concerning use by a person responsible for their safety.
- During the installation, maintenance or commissioning of the heat pump, please always wear appropriate personal protective equipment.
- Keep all plastic packaging bags away from children to prevent suffocation.

2.1. REFRIGERANT CIRCUIT

DANGER!

- In the event of accidental refrigerant leakage, avoid touching the leaking area directly. Otherwise, serious freezer burns could occur.
- The maximum operating pressure of the cooling circuit is 4.2 MPa (42 bar).
- Avoid touching the pipes, the compressor or other refrigerant circuit parts during or immediately after operating the heat pump. These could be at high or low temperature, and touching them could result in heat or freezer burns. If you need to touch these pieces, allow sufficient time for temperatures to stabilize and use protective gloves to prevent injuries.

The refrigerant circuit uses R410A as working fluid. This refrigerant is eco-friendly, as it is chlorine-free and, therefore, does not contribute to ozone layer depletion. However, any action on the refrigerant circuit should be carried out by authorized personnel only and in accordance with the applicable local regulations and the instructions outlined in this manual.

- **TOXICITY**

  Under normal operating conditions, the coolant toxicity is nil. However, in spite of its low toxicity, it could result in personal injuries under unusual equipment operating conditions.

  - In its gaseous state, the refrigerant is denser than air, thus tending to accumulate in lower levels. If the equipment is installed in a location where it is possible that refrigerant vapour accumulates at ground level, it should be well ventilated.

- Direct exposure of the refrigerant to flames produces toxic gas. However, this gas can be detected by its smell in concentrations well below the allowable limit. If you detect an unusual smell, evacuate and ventilate the area until you are sure that the gas has been fully eliminated.
- In the event of accidental refrigerant leakage, ventilate the area immediately.
- Anyone who has had contact with the refrigerant vapour should evacuate the area immediately and breathe fresh air.

■ **FLAMMABILITY**

Under normal conditions, there is no risk of explosion or combustion of the refrigerant contained in the circuit.

■ **SERVICING AND SCRAPPING**

In order to repair the refrigerant circuit, the coolant contained within should not be released to the atmosphere, but it should be recovered and destroyed in treatment plants intended for such purpose.

Considering the fact that the R410A is a mixture, in the event of leakage, the extra refrigerant should be filled in liquid state. Filling the refrigerant in gaseous state alters its composition and might cause heat pump malfunctions.

Before dismantling the heat pump, the coolant should be recovered for disposal at a treatment plant, in accordance with the current regulations.

2.2. HYDRAULIC CIRCUITS

DANGER!

■ Avoid touching the pipes, the compressor or other parts of the heating-cooling, brine and DHW circuits during or immediately after operating the heat pump. These could be at high or low temperature, and touching them could result in burns from heat or cold. If you need to touch these parts, allow time for temperatures to stabilize and use protective gloves to prevent injuries.

The installation and any further actions on the heating-cooling, brine and DHW circuits should be performed by authorized personnel only and in accordance with applicable local regulations and following the instructions provided in this manual.

2.3. ELECTRICAL INSTALLATION

DANGER!

- Before carrying out any operation on the electrical panel, disconnect the power supply.
- When the upper front cover of the heat pump is removed, the electrical panel is exposed and its components could be touched accidentally. During the installation and maintenance of the equipment, never leave the electrical panel unsupervised while exposed.
- Avoid touching any component of the electrical panel with wet hands; otherwise, electric shocks may occur.
- Avoid touching any electrical component of the heat pump (including circulation pumps, valves, legionella protection electric heater, etc.) either during or immediately after operating the equipment. Otherwise, fire or electric shocks may occur.
- Avoid using water or other liquids for cleaning the heat pump; otherwise, fire or electrical shocks may occur.

Any action carried out on the electrical installation of the equipment should be performed by an authorized installer and in accordance with the applicable local regulations and the instructions outlined in this manual.

3. HEAT PUMP OVERVIEW

3.1. MODEL IDENTIFICATION

The range of ecoGEO B heat pumps includes a built-in DHW tank of 170 litres. This range is available in 9 different models, depending on the application, the heating output and the type el power supply, as described in Table 3.1.

Model	Heating and DHW	Free cooling	Active cooling	Heating output (kW)	Power supply
ecoGEO B1 3-12	•			3-12	Single-phase
ecoGEO B2 3-12	•	•		3-12	Single-phase
ecoGEO B3 3-12	•		•	3-12	Single-phase
ecoGEO B1 5-22	•			5-22	Single-phase
ecoGEO B2 5-22	•	•		5-22	Single-phase
ecoGEO B3 5-22	•		•	5-22	Single-phase
ecoGEO B1 T 5-22	•			5-22	Three-phase
ecoGEO B2 T 5-22	•	•		5-22	Three-phase
ecoGEO B3 T 5-22	•		•	5-22	Three-phase

Table 3.1. Models available from the range of ecoGEO B heat pumps.

EcoGEO B1 models provide heating and DHW non-simultaneously, using a 3-way valve. In addition, the EcoGEO B2 models provide passive cooling option, allowing moderate cooling to the housing with a minimum consumption of the heat pump (a consumption resulting from circulation pumps only). EcoGEO B3 models provide simultaneously DHW and climate control system through cycle reversal. Each one of the three versions is available for adjustable heating outputs within the ranges 3-12 kW and 5-22 kW, given the use of inverter compressors. 3-12 kW models are available only with single-phase power supply, while 5- 22 kW models are available with both single-phase and three-phase power supply.

■ ACCESSORIES

The following accessories are supplied with the heat pump:

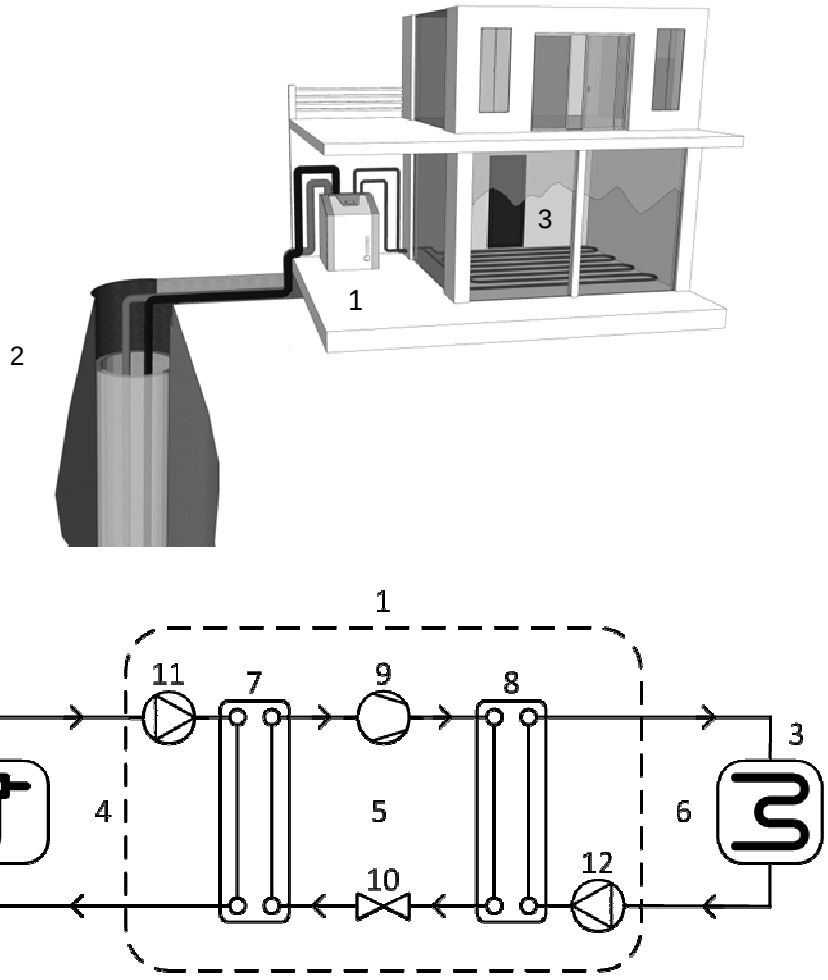
Part	Quantity
Heat pump Installation and User Manual	1
th-Tune Installation and User Manual	1
1" strainer	2
Rubber gasket kit	1
th-Tune indoor terminal	1
Outdoor temperature probe	1
Temperature sensor for external tank	2

Table 3.2. Accessories included with ecoGEO B heat pump.

3.2. OPERATING PRINCIPLES

EcoGEO geothermal heat pumps are designed for conditioning (heating and cooling) and providing DHW all-year round with simple installation and guaranteeing maximum energy efficiency at all times.

Installations with geothermal heat pumps consist of three main circuits (refrigerant circuit, brine circuit and heating-cooling circuit), in which thermal energy is carried between the ground and the building by using several fluids (refrigerant, antifreeze mixture and water). These circuits use different fluids; therefore, the transfer of thermal energy from one fluid to another is done by heat exchangers, where fluid at the highest temperature transfers heat to the fluid at the lowest temperature without mixing.



No	Description	No	Description
1	Heat pump	7	Evaporator
2	Ground source system	8	Condenser
3	Heating-cooling system	9	Compressor
4	Brine circuit	10	Expansion valve
5	Refrigerant circuit	11	Brine circulation pump
6	Heating-cooling circuit	12	Heating-cooling circulation pump

Figure 3.1. Geothermal heat pump schematic.

The operating modes provided by the different technologies included in the ECOFOREST geothermal heat pumps are outlined below.

- **HEATING MODE**

  During the normal operating cycle, heat pumps draw energy from the ground for producing hot water in the heating system. Its operation can be split into four sub-processes which are repeated on a cyclical basis.

  The antifreeze mixture is successively circulated by a circulation pump through an ground source system, where it absorbs heat from the ground, and the evaporator, where it transfers heat to the fluid in the refrigerant circuit. The refrigerant in the evaporator is at low pressure and temperature, and it vaporizes as a result of the heat absorbed by the antifreeze mixture.

  The refrigerant vapour coming from the evaporator is suctioned by the variable-speed inverter compressor, where its pressure and temperature increase (hot gas) in order to meet the actual heating demand.

  The hot gas coming from the compressor is led to the condenser, where it transfers heat to the water in the heating system. As a result of this heat transfer, the refrigerant gas cools down and condenses into liquid form.

  The refrigerant in liquid state is led back to the evaporator through the electronic expansion valve, which accurately controls the re-circulated refrigerant flow rate based on the heating system requirements. At the same time, while passing through the electronic expansion valve, the pressure and the temperature of the coolant decrease in order to attend again the condition to absorb heat from the antifreeze mixture in the evaporator.

- **FREE COOLING MODE (ECOGEO B2 MODELS ONLY)**

  The heat pump is supplied with an extra heat exchanger which allows direct heat exchange between the brine in the ground source system and the water in the cooling system, so the refrigerant circuit is not used. By using this operating mode, the compressor remains off and the cooling and brine circuits are derived to the free cooling heat exchanger through two 3-way valves. Thus, the equipment supplies fresh water to the cooling system, obtained from the energy exchange with the brine system, all with the sole use of circulation pumps.

  This technology allows to air-condition dwelling (or commercial premises) all-year round in temperate regions, where temperatures during warmer months do not reach excessively high values. It is worth mentioning that, in the FREE COOLING mode, energy consumption is very low due to the high efficiency of circulation pumps.

- **ACTIVE COOLING MODE (ECOGEO B3 MODELS ONLY)**

  Active cooling consists of reversing the operating cycle of the heat pump's refrigerant circuit through a 4-way valve. This means that the normal cycle condenser becomes the reversed cycle evaporator, and vice versa. In this operating mode, the fluid in the cooling system (water) draws heat from the dwelling and transfers it to the refrigerant in the evaporator; whereas the antifreeze mixture absorbs heat from the refrigerant in the condenser and transfers it to the ground. This operating mode is called active cooling by cycle reversing.

  This technology provides year-round air-condition for housing (or commercial premises) even in regions where temperatures reach high values during warmer months.

- **DHW MODE**

  The production of domestic hot water (DHW) is performed by two different technologies, depending on the model. For ecoGEO B1 and ecoGEO B2 models, the production of DHW is done by deviating the hot water from the condenser into the coil of the DHW tank via a 3-way valve. EcoGEO B3 models are equipped with CHW patented technology (Closed Hot Water production system). This new technology consists of incorporating an additional heat exchanger (desuperheater) intended for DHW production only. This heat exchanger is placed in series with the main condenser and feeds hot water into the coil of the DHW tank through a closed circuit. Also, given the fact that cycle reversal is done after the desuperheater, it allows simultaneous DHW and heating/active cooling production.

- **LEGIONELLA PROTECTION MODE**

  The heat pump is equipped with a electric resistance installed in the DHW tank, intended for preventing potential legionellosis outbreaks only. Once per week, the heat pump increases the storage tank temperature up to the setpoint temperature, and the electric heater is subsequently activated in order to increase the DHW temperature up to 65 ºC, i.e., a temperature at which the bacteria cannot survive more than 20 minutes. It is recommended to carry out the heating during the night, when no DHW is being consumed.

  During the normal operation of the equipment, activating the resistance for purposes other than the legionella protection function is not allowed, i.e., the electrical resistance is never used for DHW production, and it is not intended for supporting the heating system.

- **POOL MODE**

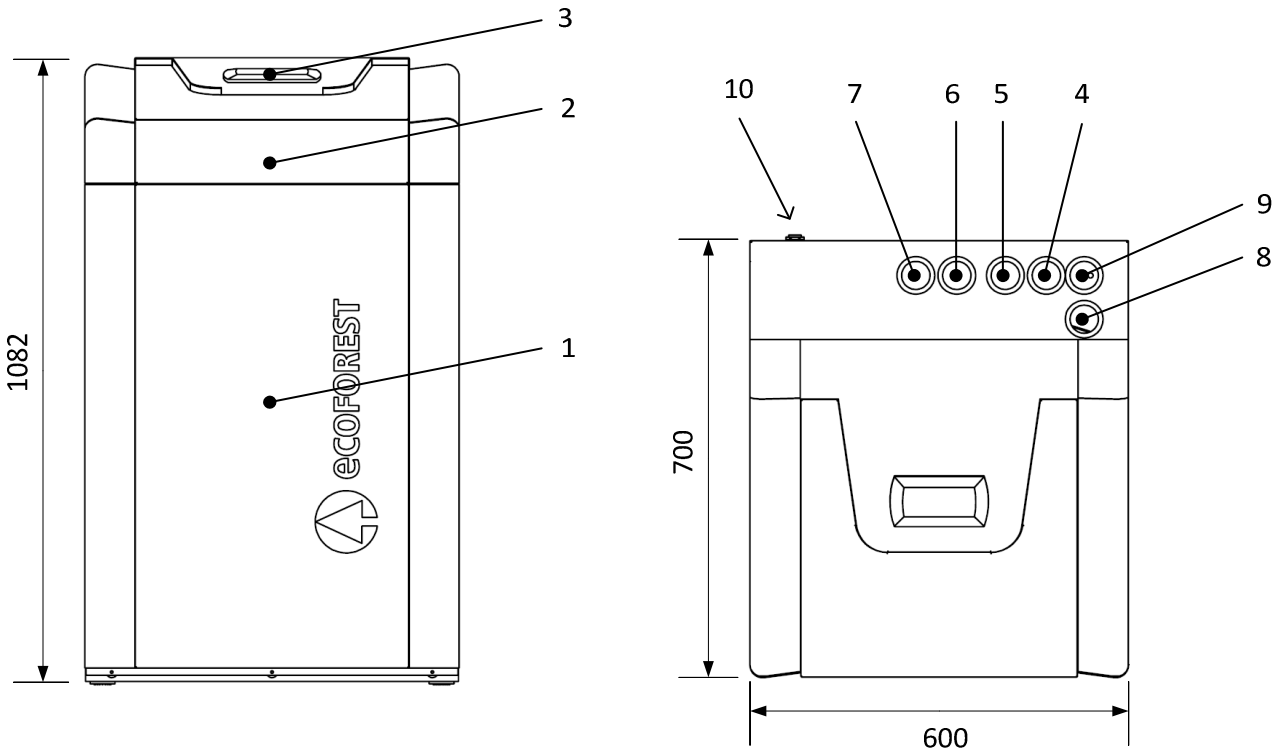
  The pool mode allows activating an external 3-way valve for deviating the hot water supply from the heat pump into a heat exchanger through which heat is transferred to the water in the swimming-pool.

- **FAULT MODE**

  In the event of heat pump failure, that impedes start the compressor, the electric heater can be activated for daily DHW production, ensuring DHW production for the user in case of heat pump failure.

3.3. DIMENSIONS AND CONNECTIONS

The general dimensions of the range of ecoGEO B heat pumps are specified in Figure 3.2.



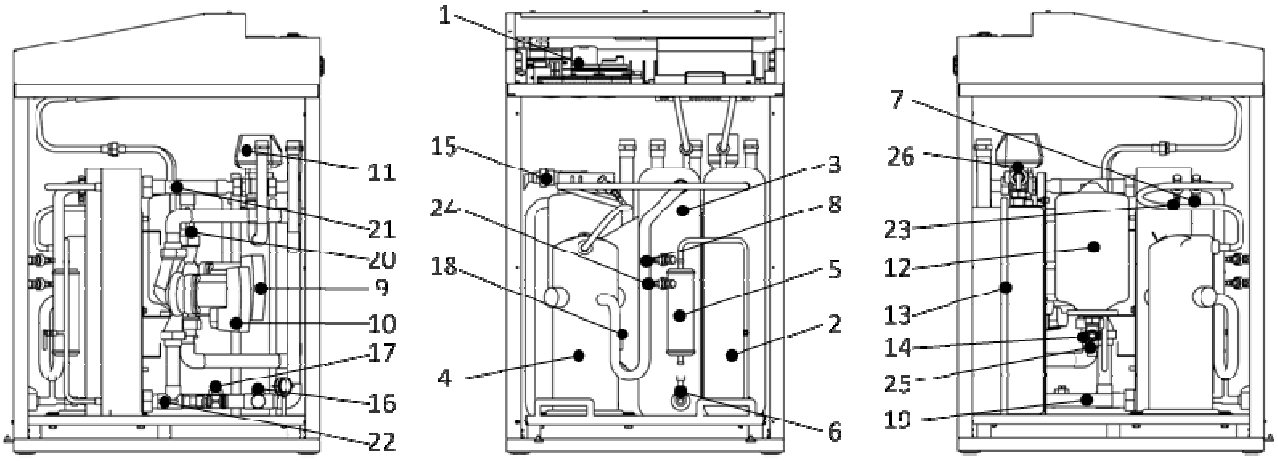
No	Description	No	Description
1	Heat pump module	6	Brine outlet (G1'' H)
2	Top cover	7	Brine inlet (G1'' H)
3	Front panel	8	DHW outlet (G3/4'' H)
4	Heating-cooling outlet (G1'' H)	9	Mains water inlet (G3/4'' H)
5	Heating-cooling inlet (G1'' H)	10	Power supply input

Figure 3.2. Dimensions and connections.

3.4. MAIN COMPONENTS

The main components and their position for the different models of ecoGEO B heat pump range are outlined below.

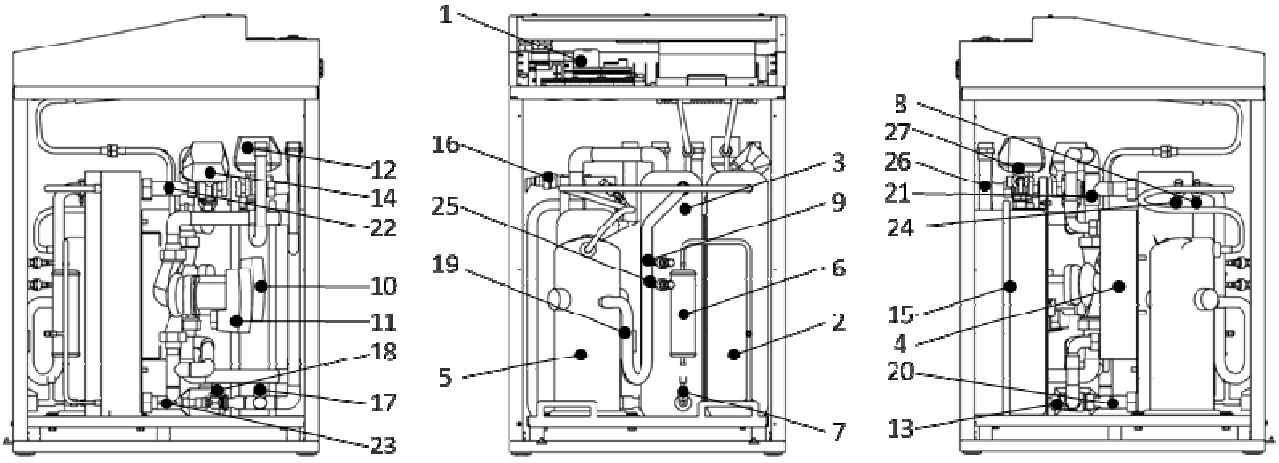
Figure 3.3 shows the location of the main components of ecoGEO B1 heat pumps.



No	Description	No	Description
1	Electrical panel	14	Brine safety valve (6 bar)
2	Condenser	15	Heating safety valve (6 bar)
3	Evaporator	16	Brine circuit drain valve
4	Inverter compressor	17	Heating circuit drain valve
5	Combi filter dryer	18	Compressor suction temperature probe
6	Electronic expansion valve	19	Brine outlet temperature probe
7	High-pressure switch	20	Brine inlet temperature probe
8	Low-pressure switch	21	Heating outlet temperature probe
9	Brine circulation pump	22	Heating inlet temperature probe
10	Heating circulation pump	23	Discharge pressure transducer
11	Heating/DHW 3-way valve	24	Suction pressure transducer
12	Brine expansion vessel (5 litters)	25	Brine pressure transducer
13	Heating expansion vessel (12 litters)	26	Heating pressure transducer

Figure 3.3. Component location in ecoGEO B1 models.

Figure 3.4 shows the location of the main components of ecoGEO B2 heat pumps.



No	Description	No	Description
1	Electrical panel	15	Heating-cooling expansion vessel (12 litters)
2	Condenser	16	Heating-cooling safety valve (6 bar)
3	Evaporator	17	Brine circuit drain valve
4	Free cooling heat exchanger	18	Heating-cooling circuit drain valve
5	Inverter compressor	19	Compressor suction temperature probe
6	Combi filter dryer	20	Brine outlet temperature probe
7	Electronic expansion valve	21	Brine inlet temperature probe
8	High-pressure switch	22	Heating-cooling outlet temperature probe
9	Low-pressure switch	23	Heating-cooling inlet temperature probe
10	Brine circulation pump	24	Discharge pressure transducer
11	Heating-cooling circulation pump	25	Suction pressure transducer
12	Heating/DHW 3-way valve	26	Brine pressure transducer
13	Free cooling 3-way valve (brine side)	27	Heating-cooling pressure transducer
14	Free cooling 3-way valve (cooling side)		

Figure 3.4. Component location in ecoGEO B2 models.

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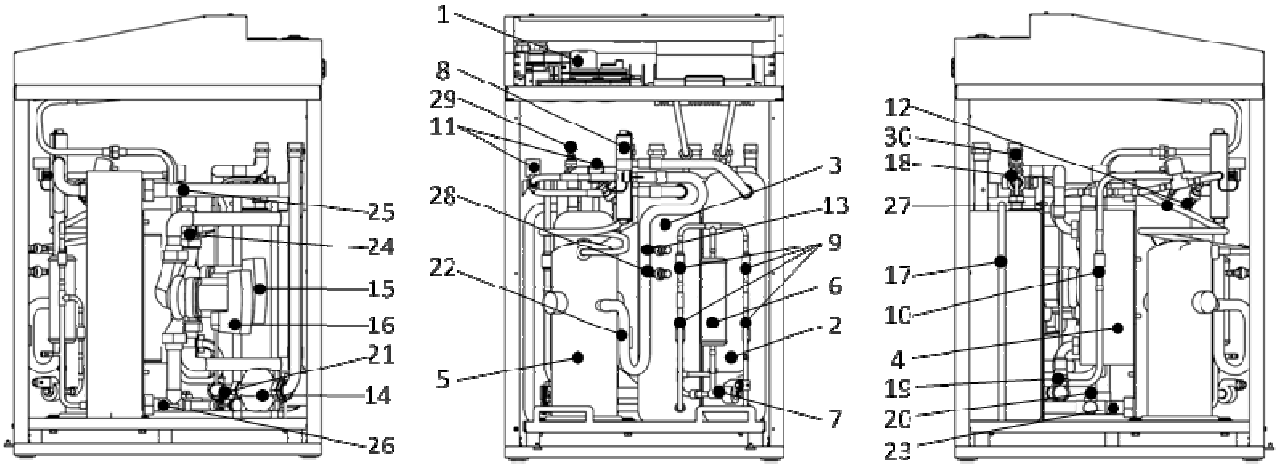
Figure 3.5 shows the location of the main components of ecoGEO B3 heat pumps.



No	Description	No	Description
1	Electrical panel	16	Heating-cooling circulation pump
2	Condenser/evap (normal/reverse cycle)	17	Heating-cooling expansion vessel (12 litters)
3	Evaporator/cond (normal/reverse cycle)	18	Heating-cooling safety valve (6 bar)
4	DHW desuperheater	19	DHW circuit drain valve
5	Inverter compressor	20	Brine circuit drain valve
6	Combi filter dryer	21	Heating-cooling circuit drain valve
7	Electronic expansion valve	22	Compressor suction temperature probe
8	4-way cycle reversing valve	23	Brine outlet temperature probe
9	Check valves for reverse cycling (x4)	24	Brine inlet temperature probe
10	DHW desuperheater check valve	25	Heating-cooling outlet temperature probe
11	Solenoid valve for DHW system activation (x2)	26	Heating-cooling temperature probe
12	High-pressure switch	27	Discharge pressure transducer
13	Low-pressure switch	28	Suction pressure transducer
14	DHW circuit circulation pump	29	Brine pressure transducer
15	Brine circulation pump	20	Heating-cooling pressure transducer

Figure 3.5. Component location in ecoGEO B3 models.

3.5. REMOVING THE COVERS

NOTE

- When removing the upper front cover, detach cautiously the cable between the micro-controller and the front panel without damaging it.

For the heat pump installation, start-up and maintenance, it is necessary to access several areas inside the heat pump. This may require removing one or several covers from the equipment housing.

The range of ecoGEO B heat pumps is equipped with top, front, side and rear detachable covers. The top cover provide access to the electrical panel; while front, side and rear cover allow access to the components of the heat pump module (see section 3.4).

- **TOP COVER AND ELECTRICAL PANEL COVER**
  1. Pull the top cover upwards and place it where it cannot be damaged.
  2. Remove the screws of the electrical panel cover.
  3. Remove the electrical panel cover and place it where it cannot be damaged.

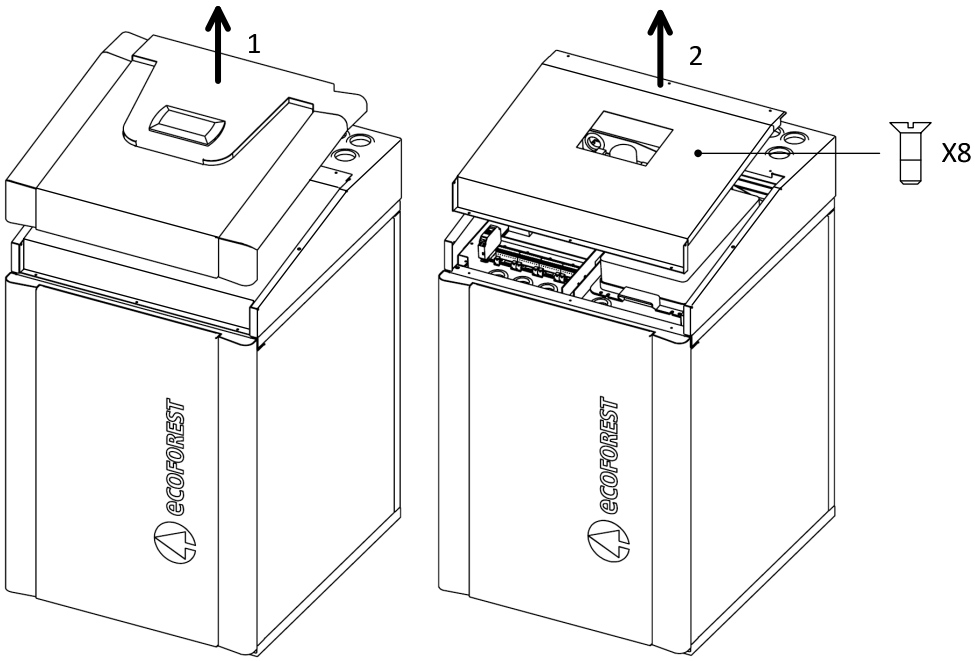


Figure 3.6. Dismounting the top cover and the electrical panel cover.

- **FRONT COVER**

1. Remove the top cover as described above.
2. Remove the screws located on the bottom side of the cover.
3. Pull the cover upwards for disengaging the top side of the cover from the equipment housing.
4. Remove the cover by pulling frontwards and place it where it cannot be damaged.

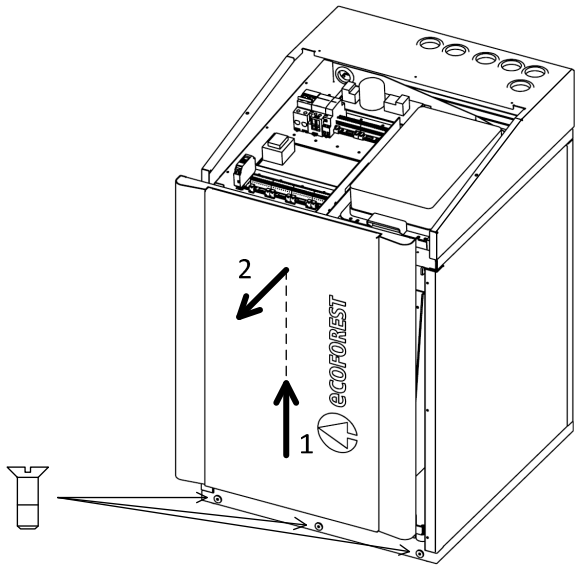


Figure 3.7. Dismounting the front cover.

■ SIDE COVERS

1. Remove the top and front covers as described above.
2. Remove the screws located on the front side of the cover that you want to dismount.
3. Pull the cover outwards for disengaging it from the equipment housing.
4. Remove the cover by pulling frontwards and place it where it cannot be damaged.

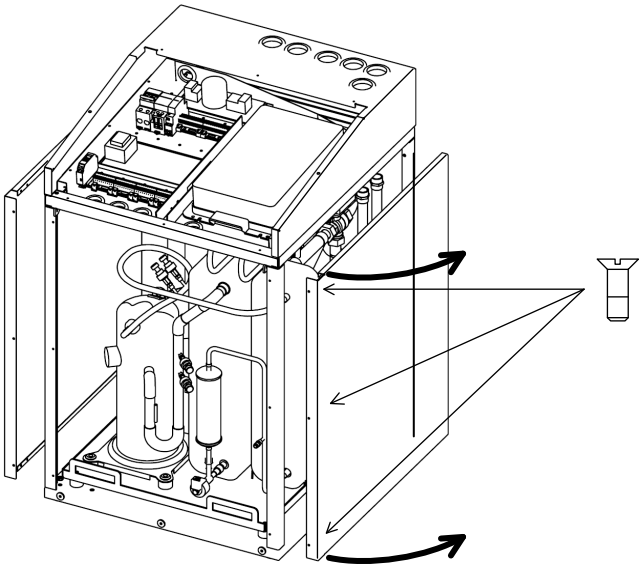


Figure 3.8. Dismounting the side covers.

■ REAR AND TOP COVERS

The heat pump rear cover can also be dismounted when necessary.

1. Remove the screws of the cover that you want to dismount.
2. Remove the cover and place it where it cannot be damaged.

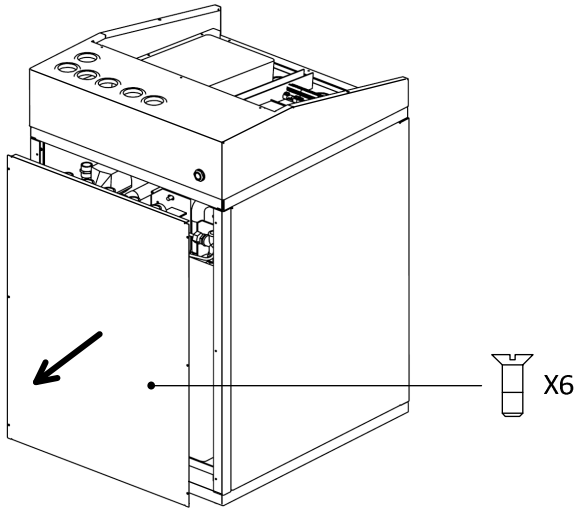
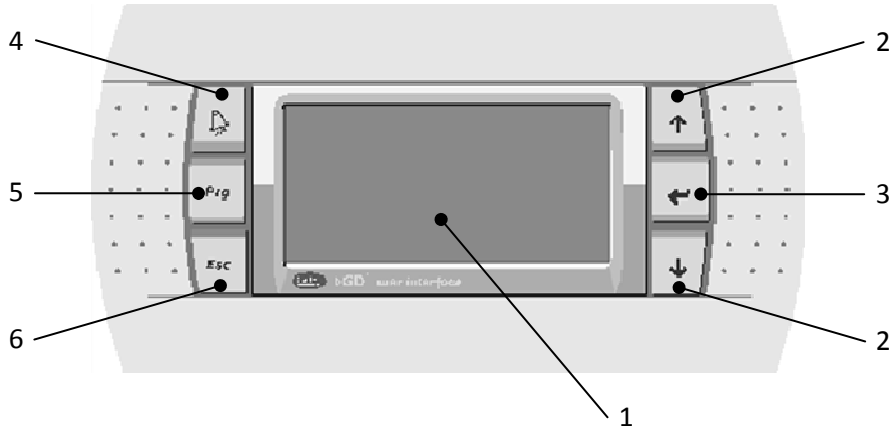


Figure 3.9. Dismounting the rear cover.

4. USER MANUAL

4.1. FRONT PANEL OVERVIEW

The heat pump front panel is equipped with a 6-key display as shown in Figure 4.1.



No	Description	No	Description
1	Screen	4	Alarms Menu access key [Alarm]
2	Scroll keys [↑]/[↓]	5	User Menu access key [Prg]
3	Select and enter key [←]	6	Back key [Esc]

Figure 4.1. Front panel.

The general functioning and operation of each key is outlined below.

- **SCROLL KEYS [↑]/[↓]**
  On screens containing menu lists, it is possible to move the cursor inside the list. Once inside the menu it is also possible to move to the previous or following screen. In screens containing configurable parameters, it enables to increase or decrease the parameter value selected with the cursor.

- **SELECT AND ENTER KEY [←]**
  On screens containing menu lists, it is possible to access the selected menu with the cursor. On screens containing configurable parameters, it allows moving the cursor to the next configurable parameter on the screen. The modified parameter is saved when moving the cursor to the next configurable parameter on the screen. Finally, it provides quick access to menu 1.8 INFORMATION from the home screen (see Table 4.2).

- **USER MENU ACCESS KEY [PRG]**
  It provides quick access to menu 1. USER from anywhere within the application (see Table 4.2).

- **PRESSING [PRG]+[ESC] KEYS SIMULTANEOUSLY**
  Pressing [Prg]+[Esc] keys simultaneously allows the quick access to menu 2. INSTALLER (see Table 4.3).

- **ACCESS BUTTON TO THE ALARMS MENU [ALARM]**
  It allows the quick access to the menu 1.9 ALARMS from any location within the program (see Table 4.2).

- **BACK BUTTON [ESC]**
  It allows going to the previous menu from any part of the program.

4.2. PROGRAMS

ECOFOREST ecoGEO heat pumps have three main operating programs, which are described below.

- **WINTER PROGRAM**
  The heat pump only allows activation of the operating modes HEATING, DHW, LEGIONELLA PROTECTION, POOL and FAULT. FREE COOLING and ACTIVE COOLING operating modes are not permitted.

- **SUMMER PROGRAM**
  The heat pump only allows activation of the operating modes FREE COOLING, ACTIVE COOLING, DHW, LEGIONELLA PROTECTION, POOL and FAULT. HEATING operating mode is not permitted.

- **AUTO PROGRAM**
  The heat pump automatically selects one of the WINTER / SUMMER operation programs based on several environmental parameters.

4.3. OPERATION SHEMES

The ecoGEO heat pump can be connected to the heating-cooling system using three different schemes. The functionality and the menus available from the heat pump control program depend greatly on the type of connection plan used. The main features of each scheme are detailed below. Pump control

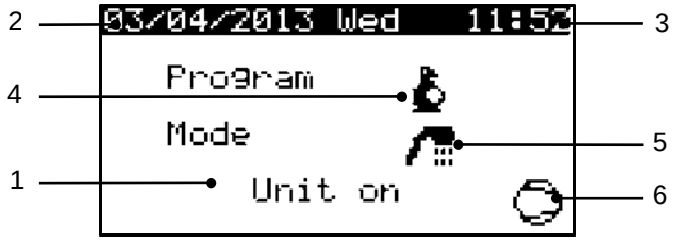
- **1 ZONE SCHEME**
  Installations with the heat pump directly connected to the heating-cooling system supplying one temperature level (hereinafter referred to as "1 Zone").

- **2 ZONE SCHEME**
  Installations with the heat pump directly connected to the heating-cooling system supplying two different temperature levels controlled by the heat pump (hereinafter referred to as "2 Zone"). The heat pump supplies directly at the highest outlet temperature (Zone 1). The lowest outlet temperature (Zone 2) is reached by an external shunt group with a modulating mixing valve.

- **BUFFER TANK SCHEME**
  Installations with the heat pump connected to a intermediate buffer tank between the heat pump and the heating-cooling system.

4.4. HOME SCREEN

The front panel turns on when the external breaker of the heat pump is activated. While the application is loading, a display with the ECOFOREST logotype opens. After a few seconds, the home screen comes up showing different icons and texts informing about the condition of the pump (operation program, operation mode, date and time, and status). Figure 4.2 shows the home screen and Table 4.1 contains the meanings for the icons that can appear on it.



No	Description	No	Description
1	Heat pump status	4	Operation program
2	Current date	5	Operation mode
3	Current time	6	Compressor status

Figure 4.2. Home screen.

Icon	Meaning
	WINTER program ON
	SUMMER program ON
AUTO	AUTO program ON
	HEATING mode ON
	DHW mode ON
	POOL mode ON
	FREE/ACTIVE COOLING mode ON
	LEGIONELLA PROTECTION mode ON
	FAULT mode ON
	Compressor starting
	Compressor running
STOP	Compressor stopping
	Compressor waiting for star/stop protection
	Compressor waiting for reverse cycling

Table 4.1. Meanings for home screen icons.

The application is structured into two main menus with different access levels.

- **MENU 1. USER**

  This menu is accessed from anywhere inside the program by pressing [Prg]. It can be accessed by the end user of the heat pump and allows turning on/off the equipment, selecting the operation program and setting several comfort parameters (see section 4.5).

- **MENU 2. INSTALLER**

  This menu is accessed from anywhere within the program by pressing [Prg]+[Esc] simultaneously and subsequently introducing the PW1 installer's password. It allows configuring the necessary parameters for setting the type of installation in which the pump is going to function, to adjust different operating parameter of the heat pump and to perform several start-up and maintenance tasks (see section 4.6).

4.5. USER MENU

Table 4.2 shows the submenu structure for menu 1. USER.

1. USER menu		
Level 1 submenu	**Level 2 submenu**	**Level 3 submenu**
1.1. On/Off	1.1.1. On/Off ecoGEO 1	
	1.1.2. On/Off ecoGEO 2	
1.2. Schedule	1.2.1. Date/Time	
	1.2.2. Daily saving time	
	1.2.3. Schedule	1.2.3.1. Time schedule
		1.2.3.2. Winter set points
		1.2.3.3. Summer set points
		1.2.3.4. Daily schedule
		1.2.3.5. Holidays
		1.2.3.6. Special days
1.3. Heating		
1.4. DHW/Legionella	1.4.1. DHW	
	1.4.2. Legionella protection	
1.5. Pool		
1.6. Free cooling		
1.7. Active cooling		
1.8. Information	1.8.1. Outdoor/indoor temp.	
	1.8.2. DHW	
	1.8.3. Brine/Heating	
	1.8.4. Brine/Heating pressures	
	1.8.5. Refrigerant circuit	
	1.8.6. Compressor/inverter	
	1.8.7. Expansion valve	
	1.8.8. Work hours	
	1.8.9. Power/day energy	
	1.8.10. Energy month/year	
	1.8.11. Version	
1.9. Alarms	1.9.1. Alarms	
	1.9.2. Reset alarms	
	1.9.3. Alarm log	

Table 4.2. USER menu structure.

The following describes the features included in each menu.

- **MENU 1.1. ON/OFF**

  - **MENU 1.1.1. ON/OFF ECOGEO 1**
    It allows switching the heat pump status between ON / OFF. The selected status can be modified by schedule, alarm or digital inputs.

    It allows selecting the operation program between AUTO / WINTER / SUMMER.

  - **MENU 1.1.2. ON/OFF ECOGEO 2**
    It shows additional information about the status of the heat pump.

- **MENU 1.2. SCHEDULE**

  - **MENU 1.2.1. DATE/TIME**
    It allows adjusting the date and the time in the control programme of the pump.

  - **MENU 1.2.2. DAILY SAVING TIME**
    It allows enabling/disabling the automatic time change between seasons. It allows adjusting the time zone to be applied and the dates/times at which time change will occur

  - **MENU 1.2.3. SCHEDULE**

    - **MENU 1.2.3.1. TIME SCHEDULE**
      It allows selecting the equipment from which the schedule is to be set between th-TUNE TERMINAL / ecoGEO HEAT PUMP / NONE. The schedule programming from th-Tune terminals displays only if these terminals have been previously enabled in menu 2. INSTALLER.

    - **MENU 1.2.3.2. WINTER SET POINTS**
      This menu is only available on 1 ZONE and 2 ZONE schemes, with schedule programming from ecoGEO HEAT PUMP and with th-Tune terminals enabled. It allows adjusting two indoor room temperature set points for the WINTER program.

    - **MENU 1.2.3.3 SUMMER SET POINTS**
      This menu is only available on 1 ZONE and 2 ZONE schemes, with schedule programming from ecoGEO HEAT PUMP and th-Tune terminals enabled. It allows adjusting two indoor room temperature set points for the SUMMER program.

    - **MENU 1.2.3.4. DAILY SCHEDULE**
      This menu is only available with 1 ZONE and 2 ZONE schemes, with schedule programming from ecoGEO HEAT PUMP. It enables you to set operating time bands for each day of the week. For the proper operation of the heat pump, at least two time bands should be set.

      In configurations with th-Tune terminals, it enables to select from the indoor room temperature set points SET1 / SET2 / OFF for each time band. In configurations with relay-type thermostats, it is only possible to select from indoor room temperature set points ON / OFF. The OFF set

point involves turning off all the operating modes of the heat pump, i.e., HEATING, FREE COOLING, ACTIVE COOLING, DHW, LEGIONELLA PROTECTION, POOL and FAULT.

Figure 4.3 shows an example of time band programming with th-Tune terminals enabled.

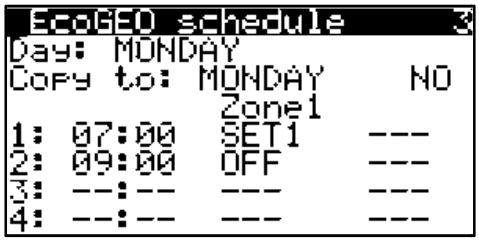


Figure 4.3. Time band programming; minimum set points for the proper functioning of the schedule.

Each day is programmed individually and remains independent. Therefore, unless otherwise specified, the heat pump will shut down per schedule at the end of the day (24:00). According to the example seen in Figure 4.4, the heat pump turns on at 7am running as per SET 1 set point, and turns off at 9am. At 11pm, it turns on again with SET 2 set point and turns off at 12am, at the end of the day.

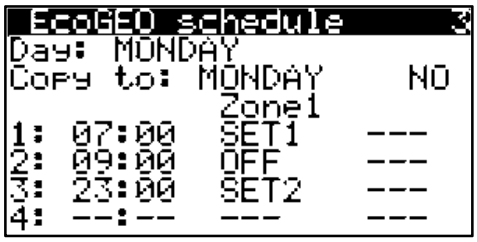


Figure 4.4. Time band programming; example where the heat pump shuts down at 12am.

In order to keep the heat pump activated during the day change, temperature set points should be adjusted to settings other than OFF, both for the end of the day and for the beginning of the next day. The combination of screens in Figure 4.4 and Figure 4.5 shows an example of this type of schedule programming, in such a way that the heat pump remains on during the transition from Monday to Tuesday and runs during the rest of the day according to the set points for each time zone.

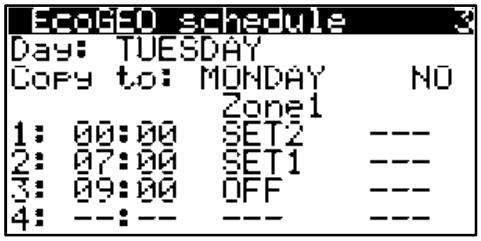


Figure 4.5. Time band programming; example of the heat pump continuing running at 12 am between Monday, represented in Figure 4.4, and Tuesday.

MENU 1.2.3.5. HOLIDAYS

This menu is only available on 1 ZONE and 2 ZONE schemes, with schedule programming from ecoGEO HEAT PUMP. It enables to set holiday periods during which you wish that the functioning of the heat pump is different from usual operation. The settings in this screen prevail over the settings in the ordinary daily schedule.

In order to set holiday periods during which the turn of the year occurs, the holiday period needs to be split in two, one for each natural year. Figure 4.6 shows an example of programming in which the holiday period starts on December 25 and ends on January 6 the following year.

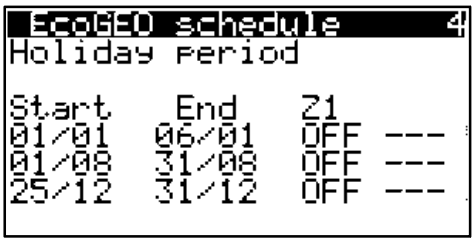


Figure 4.6. Holiday period programming with turn of year in between.

MENU 1.2.3.6. SPECIAL DAYS

This menu is only available on 1 ZONE and 2 ZONE schemes, with schedule programming from ecoGEO HEAT PUMP. It enables you to set special days during which you wish that the functioning of the heat pump is different from your usual operation. The settings in this screen prevail over the settings in the ordinary daily schedule and holiday period programming.

MENU 1.3. HEATING

In 1 ZONE and 2 ZONE schemes, the outlet temperature set point for Zone 1 (and Zone 2, if enabled) is shown. It enables you to set the offset (temperature difference) below/above the established indoor room temperature set point from which the heating production is enabled/disabled. It also allows changing the heating curve correction factor for Zone 1 and Zone 2, if enabled.

In the BUFFER TANK scheme, it shows and lets you adjust the buffer tank temperature set point.

MENU 1.4. DHW/LEGIONELLA

MENU 1.4.1. DHW

It grants to adjust the DHW temperature set point, as well as the offset (temperature difference) below the temperature set point from which the production of DHW is enabled.

MENU 1.4.2. LEGIONELLA PROTECTION

It allows to enable/disable the LEGIONELLA PROTECTION mode. It is also possible to set the day of the week and the time at which the LEGIONELLA PROTECTION mode is to start.

MENU 1.5. POOL

It permits to enable/disable the POOL mode.

MENU 1.6. FREE COOLING

This menu is only available in ecoGEO B2 models. It allows enabling/disabling the FREE COOLING mode. It is also possible to set the offset (temperature difference) below/above the established indoor room temperature set point from which the production of free cooling is being enabled/disabled.

MENU 1.7. ACTIVE COOLING

This menu is only available in ecoGEO B3 models. In 1 ZONE and 2 ZONE schemes, it shows the estimated supply temperature set point. It also lets you set the offset (temperature difference) below/above the established indoor room temperature set point from which the production of active cooling is enabled/disabled.

The BUFFER TANK scheme allows adjusting the buffer tank temperature set point.

MENU 1.8. INFORMATION

It shows all the information related to the operation of the heat pump and the condition of the installation. This menu can be quickly accessed by pressing key [←] from the home screen.

MENU 1.8.1. OUTDOOR/INDOOR TEMPERATURE

It shows the current outdoor temperature. In 1 ZONE and 2 ZONE schemes with th-Tune terminals enabled, it also shows the current indoor room temperature at Zone 1 and Zone 2, if enabled.

MENU 1.8.2. DHW

It shows the DHW set point temperature and the current temperature of the DHW tank.
In the BUFFER TANK scheme, it also shows the set point temperature and the current temperature of the buffer tank.

MENU 1.8.3. BRINE/HEATING

It shows the inlet and outlet temperatures of the brine and heating-cooling circuits, the temperature difference for each of them and the regulation of each circulation pump.

MENU 1.8.4. BRINE/HEATING PRESSURES

It shows the pressures for brine and heating-cooling circuits.

MENU 1.8.5. REFRIGERANT CIRCUIT

It shows the suction temperature and pressure (low pressure) and the discharge pressure (high pressure) in the compressor.

MENU 1.8.6. COMPRESSOR/INVERTER

It shows the rotational speed of the compressor and the temperature of the inverter.

MENU 1.8.7. EXPANSION VALVE

It shows several operating parameters of the expansion valve, such as the overheating level or the opening percentage, among others.

MENU 1.8.8. WORK HOURS

Shows the operating hours accumulated by the compressor of the heat pump.

- **MENU 1.8.9. POWER/DAY ENERGY**

  It shows the estimated instantaneous thermal energy output, electrical consumption and COP (Coefficient of Performance) of the heat pump. It also shows the mean values of the thermal energy output, electrical consumption and SPF (Seasonal Performance Factor, SPF) during the current day.

- **MENU 1.8.10. ENERGY MONTH/YEAR**

  It shows the mean values of the thermal energy output, electrical consumption and SPF (Seasonal Performance Factor, SPF) during the current month. It also shows the useable thermal energy input, the consumed electrical power and the SPF (Seasonal Performance Factor, SPF) during the current month and during the current year.

- **MENU 1.8.11. VERSION**

  It shows information on the application version, the BIOS and the expansion valve drivers installed in the heat pump.

- **MENU 1.9. ALARMS**

  This menu can be quickly accessed by pressing key [Alarm] from the home screen.

- **MENU 1.9.1. ALARMS**

  It shows the alarms that are currently activated. All the alarms included in this menu do not enable to start the compressor. If the cause of the alarm is solved, it will automatically disappear from the menu and the compressor can be restarted. There are some alarms that, if repeating five subsequent times, will trigger a permanent alarm preventing the heat pump from starting until the active permanent alarm is manually removed.

- **MENU 1.9.2. RESET ALARMS**

  It allows removing manually the permanent alarms caused by five consecutive alarms due to the same cause.

- **MENU 1.9.3. ALARM LOG**

  Provides access to the record of all alarms that occurred during the period of operation of the heat pump, indicating the date and time they were activated.

  This alarm log can be deleted from menu 2. INSTALLER.

4.6. INSTALLER MENU

Table 4.3 shows the submenu structure for menu 2. INSTALLER.

2. INSTALLER menu		
Level 1 submenu	**Level 2 submenu**	**Level 3 submenu**
2.1. Language		
2.2. Configuration	2.2.1. Heat pump model	
	2.2.2. External activation	
	2.2.3. Scheme/DHW/Pool	2.2.3.1. Operation scheme
		2.2.3.2. DHW
		2.2.3.3. Pool
		2.2.3.4. Summer buffer tank
		2.2.3.5. Drying floor
	2.2.4. Heating curve	2.2.4.1. Heating/cooling stops
		2.2.4.2. Inside parameters
		2.2.4.3. Outside parameters
		2.2.4.4. Heat. emission system
		2.2.4.5. Cool. emission system
		2.2.4.6. Insulation
		2.2.4.7. Cooling setpoint
	2.2.5. Room terminal	2.2.5.1. Relay thermostat Z1
		2.2.5.2. Relay thermostat Z2
		2.2.5.3. th-Tune
		2.2.5.4. BMS configuration
	2.2.6. Protections	2.2.6.1. Power limitation
		2.2.6.2. Brine alarm
		2.2.6.3. Pressure brine/heat.
		2.2.6.4. Cooling outlet temperature
		2.2.6.5. Trial period
	2.2.7. Manual test	2.2.7.1. Brine pump
		2.2.7.2. Heating pump
		2.2.7.3. Inverter contactor
		2.2.7.4. Electric heater cont.
		2.2.7.5. Shunt group Z2
		2.2.7.6. Alarm system
		2.2.7.7. DHW valve
		2.2.7.8. Free cooling valve
		2.2.7.9. DHW pump
		2.2.7.10. Reversing valve
		2.2.7.11. Pool
		2.2.7.12. Zone 1 valve
	2.2.8. Probe conf.	2.2.8.1. Brine outlet temp.
		2.2.8.2. Brine inlet temp.
		2.2.8.3. Heating outlet temp.
		2.2.8.4. Heating inlet temp.
		2.2.8.5. Brine pressure
		2.2.8.6. Heating pressure
		2.2.8.7. Suction temp.

		2.2.8.8. Suction pressure
		2.2.8.9. Discharge. pressure
		2.2.8.10. DHW temperature
		2.2.8.11. Buffer tank/Outlet temp. Z2
		2.2.8.12. Outside temperature
	2.2.9. Default values	2.2.9.1. Initialization
		2.2.9.2. Reset energy meters
2.3. Alarm log		
2.4. Change password		

Table 4.3. INSTALLER menu structure.

The functions included in each menu are as follows:

■ **MENU 2.1. LANGUAGE**

This allows selecting the language of the application of the heat pump.

■ **MENU 2.2. CONFIGURATION**

■ **MENU 2.2.1. HEAT PUMP MODEL**

This allows selecting the model of the heat pump in the range ecoGEO B range.

■ **MENU 2.2.2. EXTERNAL ACTIVATION**

This allows activating/deactivating the remote turning on/off of the heat pump through a voltage-free signal connected to a digital input DI2 (see section 7).

■ **MENU 2.2.3. SCHEME/DHW/POOL**

■ **MENU 2.2.3.1. OPERATION SCHEME**

This allows selecting the installation scheme in which the heat pump is working among 1 ZONE / 2 ZONES / BUFFER TANK.

In this menu, it can also be selected the special program for under-floor drying selecting the scheme FLOOR DRYING.

■ **MENU 2.2.3.2. DHW**

This allows activating/deactivating the DHW mode.

■ **MENU 2.2.3.3. POOL**

This menu is only available for the schemes 1 ZONE and 2 ZONES with models ecoGEO B1 and B2. In the models ecoGEO B3, it is available for all the schemes. It allows activating/deactivating the POOL mode. It also allows adjusting the supply temperature during the POOL mode to the pool heat exchanger, as well as the minimum time of operation in POOL mode in case of possible heating demand.

■ **MENU 2.2.3.4. SUMMER BUFFER TANK**

This menu is available only for the models ecoGEO B1 and B2 with scheme BUFFER TANK. It allows activating/deactivating the production of hot water for the buffer tank in Summer. It also allows adjusting a buffer tank temperature set point different from the one in Winter and setting

the time band in which the production of heat for the buffer tank is permitted. Within this time band, priority is given to the production of hot water for the buffer tank over the free cooling production.

■ MENU 2.2.3.5. DRYING FLOOR

This menu is available only with the scheme DRYING FLOOR. It allows adjusting the maximum outlet temperature, the maximum time of operation and the waiting time of the drying floor mode.

■ MENU 2.2.4 HEATING CURVE

■ MENU 2.2.4.1. HEATING/COOLING STOPS

This allows adjusting the maximum outside temperature to which the production of heating is permitted and the minimum outside temperature to which the production of cooling is permitted.

■ MENU 2.2.4.2. INSIDE PARAMETERS

This allows defining the inside design point in the heating curve by adjusting the inside design temperature. This temperature must be adjusted to the comfort indoor temperature used for the heating system design. It is recommended to use temperatures between 21 and 23 ºC. The outlet temperature of the heat pump at this spot takes the same value than the inside temperature, previously adjusted.

■ MENU 2.2.4.3. OUTSIDE PARAMETERS

This allows defining the outside design point in the heating curve by adjusting the outside design temperature and the outlet temperature for the outside design point. The outside design temperature must be adjusted to the minimum outdoor temperature of the place used for the heating system design. The flow temperature of the heat pump to this point takes the same value as the temperature of interior design, previously set.

■ MENU 2.2.4.4. HEAT. EMISSION SYSTEM

This allows selecting the types of heating emission systems used in the Zone 1 (and in the Zone 2 if it is activated) among HEATING FLOOR / FAN COILS / LOW TEMPERATURE RADIATOR.

■ MENU 2.2.4.5. COOL. EMISSION SYSTEM

This menu is available only for the models ecoGEO B2 and B3. This allows selecting the types of cooling emission systems used in the Zone 1 (and in the Zone 2 if it is activated) among HEATING FLOOR / FAN COILS / LOW TEMPERATURE RADIATOR.

■ MENU 2.2.4.6. INSULATION

This allows selecting the insulation level of the building among GOOD / REGULAR / BAD.

■ MENU 2.2.4.7. COOLING SETPOINT

This menu is available only with models ecoGEO B3. It allows adjusting the outlet temperature value in ACTIVE COOLING mode.

MENU 2.2.5. HEATING/COOLING CONTROL

MENU 2.2.5.1. RELAY THERMOSTAT Z1

This allows activating/deactivating the digital inputs of relay thermostat for the production of heating and cooling in Zone 1. It also allows selecting the logic used in each one of the digital inputs between NO / NC (normally open / normally closed).

MENU 2.2.5.2. RELAY THERMOSTAT Z2

This menu is available only with 2 ZONES scheme. This allows activating/deactivating the digital inputs of relay thermostat for the production of heating and cooling in Zone 2. It also allows selecting the logic used in each of the digital inputs between NO / NC (normally open / normally closed).

MENU 2.2.5.3.TH-TUNE

This allows activating/deactivating the use of indoor th-Tune terminals. It also allows adjusting the address of each th-Tune terminal installed. It is recommended to use address 1 for the terminal of Zone 1 and address 2 for the terminal of Zone 2, respectively.

MENU 2.2.5.4. BMS CONFIGURATION

This allows setting the communication data parameters of the port of the micro-controller where the indoor th-Tune terminal is connected (BMS port). To use the th-Tune terminals, it is necessary to use the default configuration, which is shown in Figure 4.7.

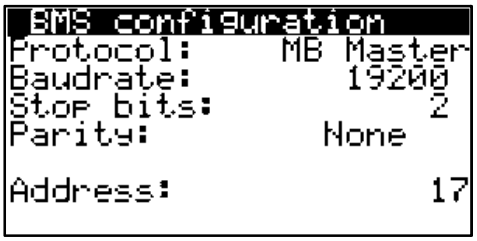


Figure 4.7. Default configuration of the BMS port for the correct operation of the th-Tune indoor terminals.

MENU 2.2.6. PROTECTIONS

MENU 2.2.6.1. POWER LIMITATION

This allows adjusting the maximum thermal power given by the heat pump, which is established by limiting the maximum rotation speed of the compressor.

In section 12.6 there are illustrations with the relations of the thermal power provided by the different heat pump models as a function of the rotation speed of the compressor for the different operation conditions. Furthermore, in section 12.7, there are illustrations with the relations of the electrical consumption of the different heat pump models as a function of the rotation speed of the compressor for the different operation conditions.

MENU 2.2.6.2. BRINE ALARM

It allows adjusting the value under which the alarm is activated due to low temperature in the brine system.

■ MENU 2.2.6.3. PRESSURE BRINE/HEATING

This allows adjusting the values under which the alarm are activated due to low pressure in the brine and heating-cooling circuits.

■ MENU 2.2.6.4. COOLING OUTLET TEMPERATURE

This menu is available only in the models ecoGEO B3. This allows adjusting the value under which the alarm is activated due to low outlet temperature in ACTIVE COOLING mode.

■ MENU 2.2.6.5. TRIAL PERIOD

This allows activating/deactivating a trial period in which the heat pump is blocked. It also allows adjusting the trial period time. Once the heat pump is blocked, it is possible to unblock by deactivating the trial period.

■ MENU 2.2.7. MANUAL TEST

■ MENU 2.2.7.1. BRINE PUMP

This allows activating/deactivating manually the brine pump and adjusting its percentage of rotation speed.

■ MENU 2.2.7.2. HEATING PUMP

This allows activating/deactivating manually the heating-cooling pump and adjusting the percentage of rotation speed.

■ MENU 2.2.7.3. INVERTER CONTACTOR

This allows activating/deactivating manually the contactor to activate the inverter. The activation of the inverter doesn't imply the compressor start, it only allows verifying that the inverter is properly energized.

■ MENU 2.2.7.4. ELECTRIC HEATER CONTACTOR

This allows activating/deactivating manually the legionella protection electric heater. The electric heater is deactivated automatically when exiting the menu 2.4.7. MANUAL TEST.

■ MENU 2.2.7.5. SHUNT GROUP Z2

This allows activating/deactivating manually the power supply of the external shunt group and adjusting the percentage of bypass of the 3-way modulating valve.

■ MENU 2.2.7.6. ALARM SYSTEM

This allows activating/deactivating manually the alarm signal of the heat pump.

■ MENU 2.2.7.7. DHW VALVE

This menu is available only in the models ecoGEO B1 and ecoGEO B2. This allows activating/deactivating manually the 3-way valve for DHW production. The value ON positions the valve in DHW mode and the value OFF positions the valve in HEATING mode.

■ MENU 2.2.7.8. FREE COOLING VALVE

This menu is available only in the model ecoGEO B2. This allows activating/deactivating manually the free cooling 3-way valves. The value ON positions the valves in FREE COOLING mode and the value OFF positions the valve in HEATING/DHW mode.

■ MENU 2.2.7.9. DHW PUMP

This menu is available only in the model ecoGEO B3. This allows activating/deactivating manually the circulation pump and the solenoid valves of the DHW production system (CHW system).

■ MENU 2.2.7.10. REVERSING VALVE

This menu is available only in the model ecoGEO B3. This allows activating/deactivating manually the 4-way cycle reversing valve. The value ON positions the valve in HEATING mode (direct cycle) and the value OFF positions the valve in ACTIVE COOLING mode (reverse cycle).

■ MENU 2.2.7.11. POOL

This allows activating/deactivating manually the 3-way derivation valve to the pool heat exchanger. The position of the valve for the values ON/OFF depends on its hydraulic installation.

■ MENU 2.2.7.12. ZONE 1 VALVE

This allows activating/deactivating manually the 2-way valve for Zone 1. The value ON energize the valve and the value OFF de-energized it.

■ MENU 2.2.8. PROBE CONFIGURATION

■ MENU 2.2.8.1. BRINE OUTLET TEMPERATURE

It shows the type of temperature probe installed in the brine circuit outlet and its current reading. It also allows entering a correction for the sensor reading.

■ MENU 2.2.8.2. BRINE INLET TEMPERATURE

It shows the type of temperature sensor installed in the brine circuit inlet and its current reading. It also allows entering a correction for the sensor reading.

■ MENU 2.2.8.3. HEATING OUTLET TEMPERATURE

It shows the type of temperature sensor installed in the heating-cooling circuit outlet and its current reading. It also allows entering a correction for the sensor reading.

■ MENU 2.2.8.4. HEATING INLET TEMPERATURE

It shows the type of temperature sensor installed in the heating-cooling inlet circuit and its current reading. It also allows entering a correction for the sensor reading.

■ MENU 2.2.8.5. BRINE PRESSURE

It shows the type of pressure sensor installed in the brine circuit and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.8.6. HEATING PRESSURE**

  It shows the type of pressure sensor installed in the heating-cooling circuit and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.8.7. SUCTION TEMPERATURE**

  It shows the type of temperature sensor installed in the compressor suction (refrigerant circuit) and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.8.8. SUCTION PRESSURE**

  It shows the type of pressure sensor installed in the compressor suction (refrigerant circuit) and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.8.9. DISCHARGE PRESSURE**

  It shows the type of pressure sensor installed in the compressor discharge (refrigerant circuit) and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.8.10. DHW TEMPERATURE**

  It shows the type of pressure sensor installed in the DHW tank and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.8.11. BUFFER TANK / OUTLET TEMPERATURE Z2**

  In 2 ZONES scheme show the type of temperature sensor installed in the outlet temperature for Zone 2 of the heating-cooling circuit and its current reading. In scheme BUFFER TANK shows the type of temperature sensor installed in the buffer tank and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.8.12. OUTSIDE TEMPERATURE**

  It shows the type of outside temperature sensor and its current reading. It also allows entering a correction for the sensor reading.

- **MENU 2.2.9. DEFAULT VALUES**

  - **MENU 2.2.9.1. INICIALIZATION**

    It allows deleting the adjustments made in Menu 1. USER and 2. INSTALLER and recovering the default configuration.

  - **MENU 2.2.9.2. RESET ENERGY METERS**

    It allows resetting the energy meters.

- **MENU 2.3. ALARM LOG**

  This allows deleting the alarms log record of the heat pump.

- **MENU 2.4. CHANGE PASSWORD**

  This allows changing the access password (PW1) to the menu 2. INSTALLER.

5. TRANSPORT AND LOCATION

Follow these steps in the indicated order to disassemble the heat pump and place it in its final place of installation.

1. Carefully take the heat pump out of the package (wooden box, plastic, etc.).
2. Carefully take the moorings that fix the heat pump.
3. Check that the heat pump has not been damaged during transportation and that all its components are included.
4. Place the heat pump in its place of installation.

Take into account the recommendations about its transport and location of sections 5.1 to 5.3.

5.1. TRANSPORT AND HANDLING

DANGER!

- The heat pump can weigh up to 240 kg net. The device must be handled by, at least, two operators using a hand truck to avoid personal injuries.

NOTE

- The heat pump should never be bent more than 45º vertically as this may provoke the malfunctioning of the equipment.

EcoGEO B heat pumps must be transported in vertical position in such a way that they are not exposed to inclement weather.

When moving the heat pump to its place of installation, it must be carefully handled. If strictly necessary, the heat pump can be disassembled in two modules for easy transportation and handling.

5.2. RECOMMENDATIONS FOR LOCATION

NOTE

- Do not install the heat pump near machines which issue electromagnetic activity, as they may interfere with the electronic components and make the equipment stop working properly.

The heat pump must be installed on a stable base, preferably concrete, which is capable of supporting the total weight indicated in the technical specifications (see section 12.1) as well as the volume of water contained in the DHW tank (170 kg approx.). If the heat pump is installed on an unstable base (for example, wood), this must be reinforced so that it supports the total weight of the equipment.

Before selecting the place of installation of the heat pump, consider the following recommendations.

- Choose a dry place where there is no risk of frost.
- If possible, install the heat pump with the back side towards an exterior wall and in a place where the noise emissions do not cause a problem. Whenever possible avoid installation against bedrooms or other places where noise emissions may be annoying. Avoid installing the heat pump near a corner, as this may amplify the level of the equipment noise emission.

- Check that the heating-cooling, brine, mains water and DHW piping can be installed properly. To avoid condensation in the piping of the brine circuit, try to minimize as much as possible these sections inside the building and insulate them properly.
- Check that there is enough space to carry out the installation and maintenance work of the heat pump comfortably (see section 5.3).

Once the heat pump is positioned in its final location, it is necessary to level it so that it remains in horizontal position. For this reason, it is fitted with adjustable feet of up 25 mm in height to compensate for possible irregularities of the base surface. Is the irregularities of the base cannot be compensated with the height-adjustable feet; the base must be sufficiently leveled before installing the heat pump.

5.3. SERVICE AREAS

It is recommended to leave enough space around the heat pump in order to make installation and maintenance work easier. The recommended minimum distances regarding walls and other elements are the following.

- 300 mm from the sides.
- 600 mm from the front.
- 10 mm from the back

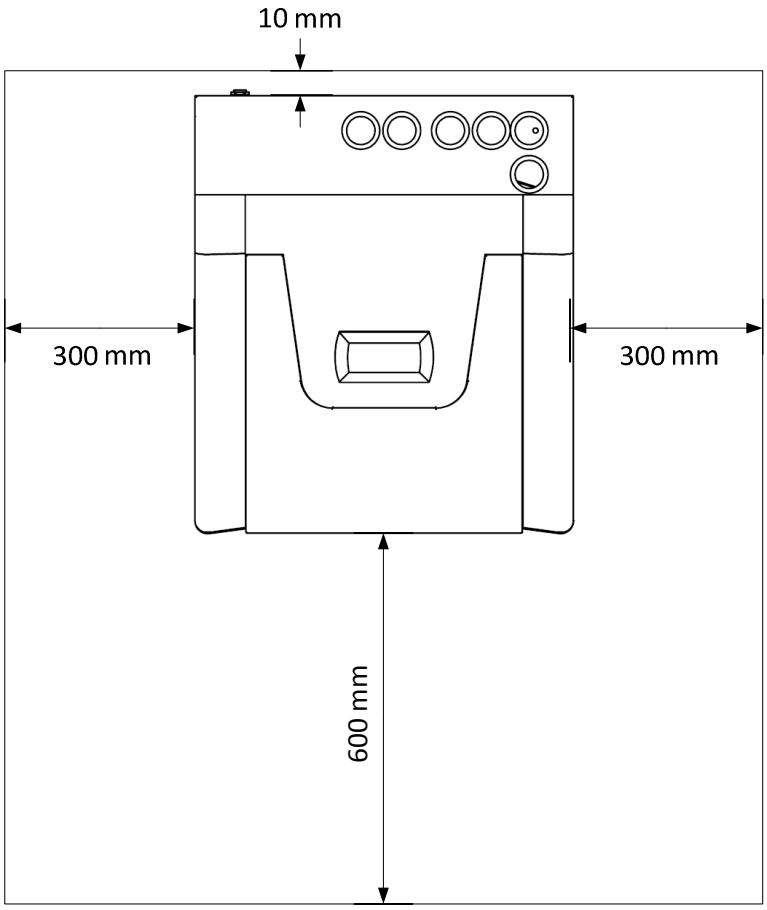


Figure 5.1. Recommended minimum service areas regarding the heat pump.

6. HYDRAULIC INSTALLATION

6.1. HEATING/COOLING CIRCUIT CONECTION

DANGER!

- Do not install components that may clog the inlet or outlet ports of the safety valve of the heating/cooling system; there may be risk of breaking some of its components and cause injury and/or damage to property.
- When installing the heating/cooling circuit, special care must be taken to avoid getting water on the electrical panel and this could produce personal injury from electrical shock and/or make the equipment malfunction.

NOTE

- EcoGEO B heat pumps must not be used in heating systems with high temperature radiators or in other appliances which require outlet temperatures of above 55 ºC, which would make the equipment malfunction.
- Make sure the pipe connections are not subject to stress as this may cause leaks.
- The inlet and outlet pipes of the heating/cooling circuit must be insulated thermally to prevent unnecessary heat losses and avoid risks of freezing the fluid.

EcoGEO heat pumps are designed to be used in heating systems with low temperature radiators (under-floor or fan coils) or medium temperature radiators (thermoconvector or low temperature radiators). In order to obtain the maximum energy efficiency of the equipment it is recommended to design the heating system with an outlet temperature as low as possible (ideally around 30 ºC) as the increase of the outlet temperature causes a significant reduction of energy efficiency.

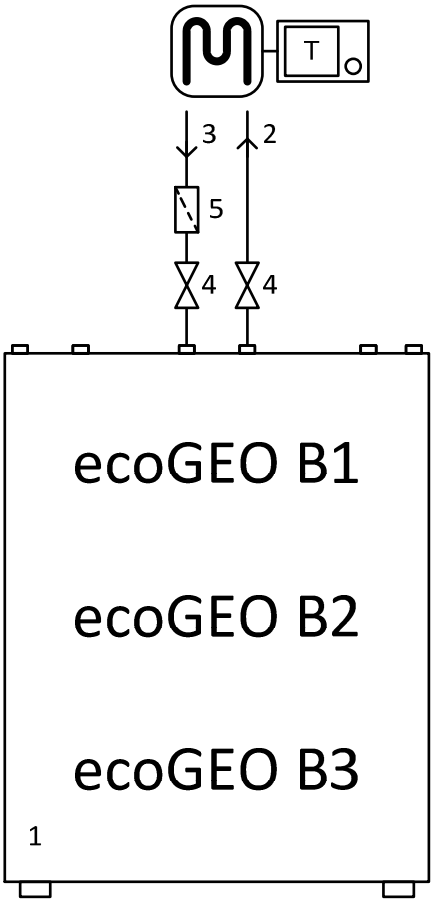
Inside the heat pump there are included the following components required for the heating-cooling system (see section 3.4).

- Variable speed and high efficiency circulation pump (energy class A).
- Expansion vessel (12 litres).
- Safety valve (6 bar gauge).
- Drain valve.

To connect the heating-cooling circuit, consider the information indicated in Figure 6.1 and the following recommendations.

- Use the flexible hoses that are included with the heat pump in order to avoid excessive stress in the inlet and outlet pipes.
- Install shut-off valves in the outlet and inlet pipes of the heating-cooling circuits, as close to the heat pump as possible to facilitate future maintenance work of the heat pump.
- Install a strainer in the heating-cooling circuit inlet.
- Install air vents in all places of the installation where air bubbles may form.

- Insulate thermally all the inlet and outlet pipes in order to prevent unnecessary heat losses and condensation problems.



No	Description	No	Description
1	Heat pump	4	Shut-off valve
2	Heating-cooling outlet, (G1'' H)	5	Strainer
3	Heating-cooling inlet, (G1'' H)		

Figure 6.1. General scheme of heating-cooling circuit connections.

6.2. DHW TANK CONNECTION

DANGER!

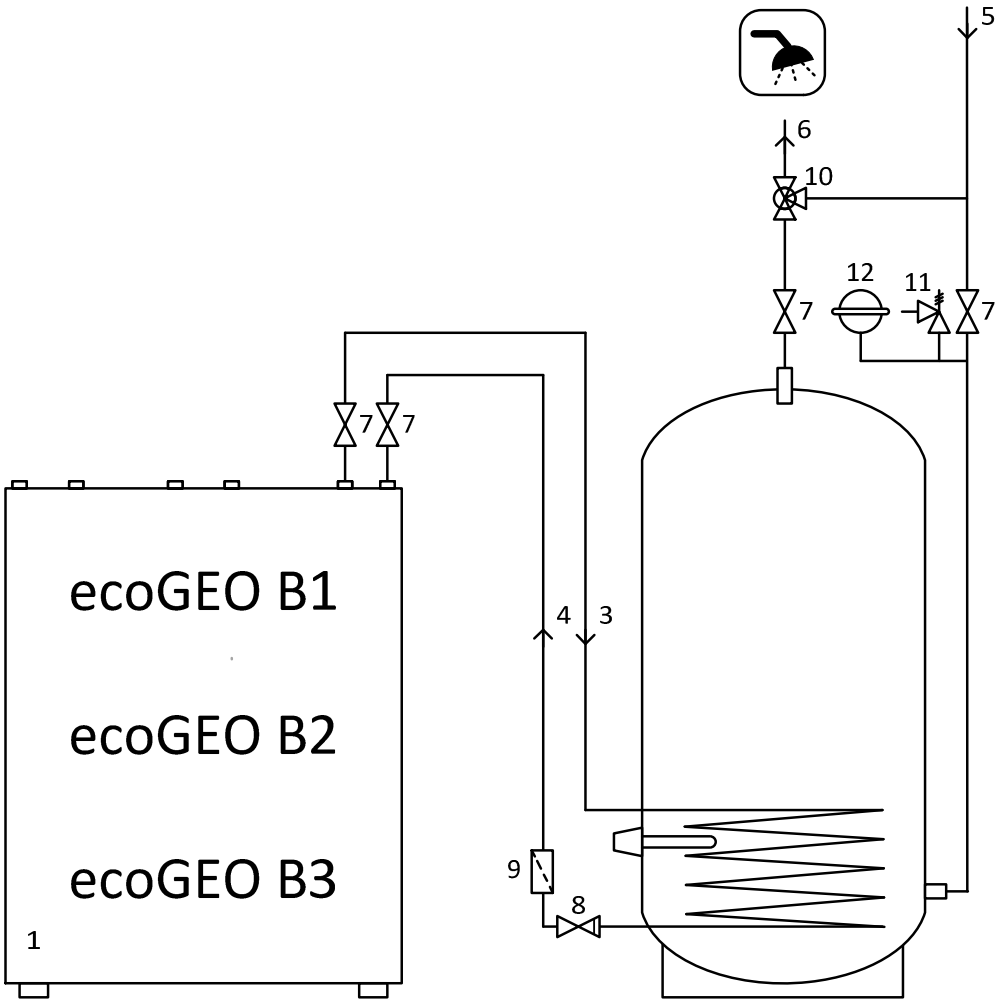
- Do not install components that may clog the inlet or outlet ports of the safety valve of the DHW tank; there may be risk of breaking the tank and causing injury and/or damage to property.
- When installing the DHW circuit, special care must be taken to avoid getting water on the electrical panel. This could produce personal injury from electrical shock and/or make the equipment malfunction.

NOTE

- For proper operation of ecoGEO B heat pumps during DHW preparation the coil of the DHW tank should has a minimum heat transfer area of 2.5 m^2.
- Make sure the pipe connections are not subject to stress as leaks may occur.

To connect the DHW circuit, take into account the information of Figure 6.2 and the following recommendations.

- To facilitate future maintenance work of the heat pump, install shut-off valves in the mains water inlet and in the DHW outlet.
- Install a check valve in the mains water inlet in order to avoid possible hot water returning from the tank to the main network.
- Install a check valve in the DHW coil circuit in order to avoid possible inverse circulation of the water.
- Install air vents where necessary in the DHW coil circuit in order to avoid possible air bubble formation.
- If necessary, install a security group (expansion vessel + safety valve) in the mains water inlet to avoid possible overpressures in the DHW tank.
- Due to LEGIONELLA PROTECTION mode (see section 3.2) the temperature of water in the DHW tank may reach 70 ºC. If the installation of the DHW in the place lacks thermostatic taps, it is recommended to install a thermostatic mixing valve in the DHW outlet to avoid risk of scalding.
- If the maximum system pressure can exceed 5 bars, it is recommended to install a pressure reducing valve in the mains water inlet in order to avoid overpressure in the DHW tank.
- For a correct operation of the installation, a mains water pressure of at least 2 bars must be guaranteed in order to obtain a DHW flow rate of at least 20-25 l/min. Remember that the water pressure is reduced during periods of high water consumption. Check that the minimum operating pressure of the installation is ensured under these conditions.
- Insulate thermally the DHW outlet pipe in order to prevent unnecessary heat losses.



No	Description	No	Description
1	Heat pump	7	Shut-off valve
2	DHW tank	8	Check valve
3	DHW coil circuit outlet (G3/4” H)	9	Strainer
4	DHW coil circuit inlet (G3/4” H)	10	Thermostatic mixing valve
5	Mains water inlet, (G1’’ H)	11	Safety valve (8 bar)
6	DHW outlet, (G1’’ H)	12	Expansion vessel

Figure 6.2. General scheme of DHW circuit connection.

6.3. BRINE CIRCUIT CONNECTION

DANGER!

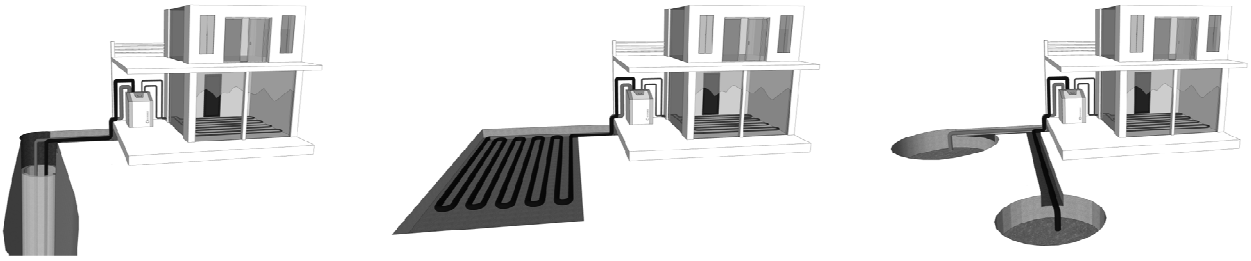
- Do not install components that may clog the inlet or outlet ports of the safety valve of the brine system. There may be risk of breaking some of its components and causing injury and/or damage to property.
- When installing the brine circuit, special care must be taken to avoid getting antifreeze mixture on the electrical panel as this could produce personal injury from electrical shock and/or make the equipment malfunction.

NOTE

- Insulate thermally the brine circuit pipes in order to prevent condensation and/or frost formation as the brine circuit pipes may reach temperatures below 0 ºC.
- Make sure there pipe connections are not subject to stress as this may cause leaks.
- In brine systems with groundwater, it is recommended to use an intermediate exchanger to avoid freezing problems and evaporator fouling.

EcoGEO heat pumps can be used with vertical probes, horizontal collectors or groundwater brine systems, as shown in Figure 6.3. The brine system must be properly dimensioned, taking into account the geographical area, the terrain conditions, the heating-cooling and brine systems used and the thermal power of the heat pump.

When brine systems are used with more than one circuit, these must be connected in parallel so that the flow rate circulation through each is similar. The maximum length of all the brine system pipes should not exceed 400 m.



Vertical probe | Horizontal collector | Groundwater system

Figure 6.3. Types of brine systems.

In vertical probe systems, it is recommended to use circuits between 80 and 150 m long, with a minimum separation between circuits of 8 meters.

In horizontal collector systems, it is recommended to bury the coil between 1.2 and 2 meters deep and with a separation between tubes of at least 0.8 meters.

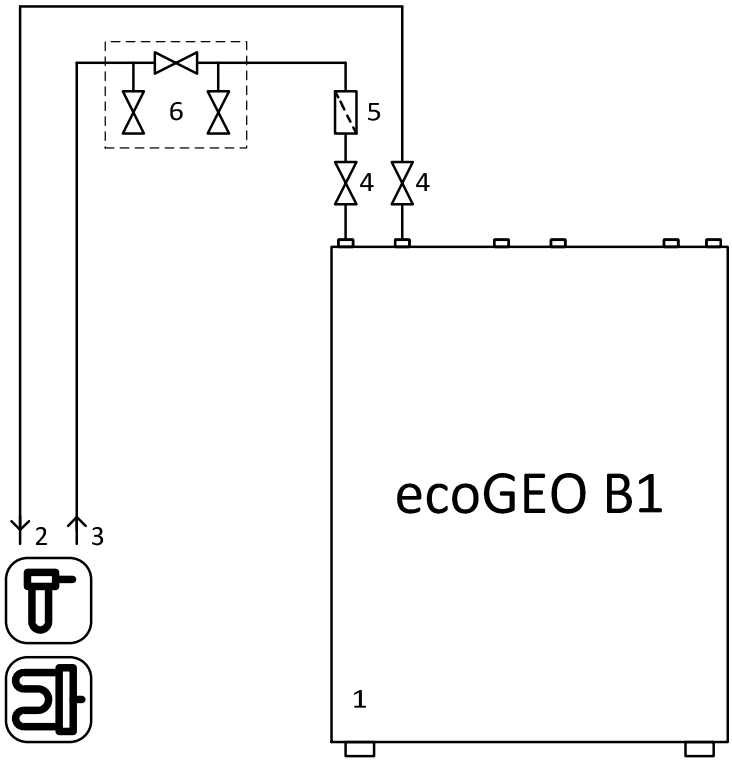
The refrigerant evaporation temperature can fall below 0 ºC. For this reason, in brine systems with groundwater, it is recommended to use an intermediate intercooler to prevent freezing problems and fouling in the evaporator of the heat pump.

Inside the heat pump there are included the following components required for the brine system.

- Variable speed and high efficiency circulation pump (energy class A).
- Expansion vessel (5 liters). Only in ecoGEO B1 models.
- Safety valve (6 bars gauge). Only in ecoGEO B1 models.
- Drain valve

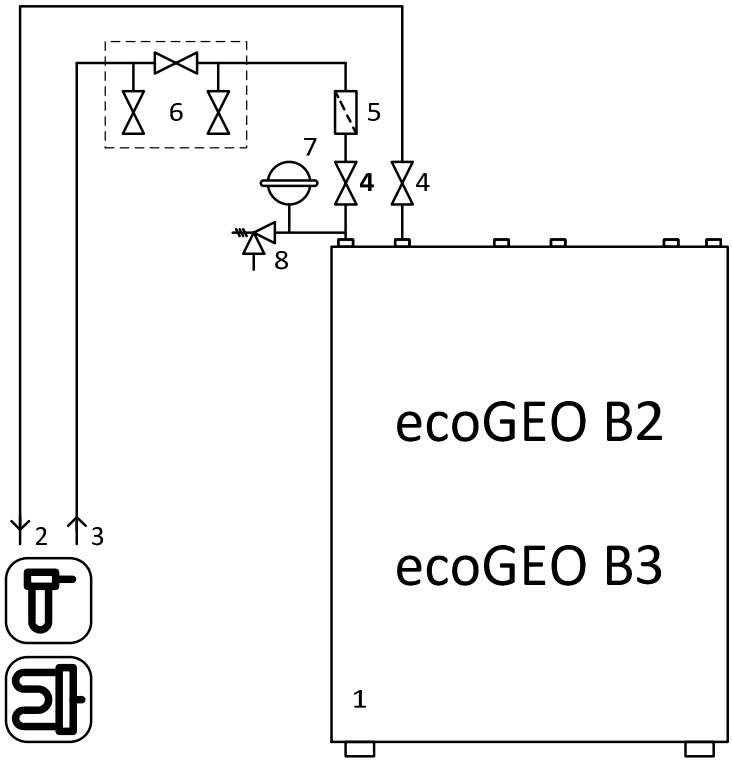
To connect the brine circuit, take into account the information in Figure 6.4 and Figure 6.5 and the following recommendations.

- Use the flexible hoses that are included with the heat pump in order to avoid excessive stress in the inlet and outlet pipes.
- Install shut-off valves in the outlet and inlet heating-cooling circuits, as close to the heat pump as possible to facilitate future maintenance work.
- Install the necessary components to carry out the filling/emptying of the working fluid in the return pipe.
-
- Install a strainer in the inlet circuit. It is recommended to install shut-off valves just before and after the strainer in order to avoid antifreeze mixture losses during cleaning or filter replacement.
- Install air vents at all points of the installation where air bubbles may form.
- Insulate thermally the brine circuit pipe in order to prevent unnecessary heat losses and avoid condensation problems.



No	Description	No	Description
1	Heat pump	4	Shut-off valve
2	Brine outlet, (G1'' H)	5	Strainer
3	Brine inlet, (G1'' H)	6	Brine filling fitting

Figure 6.4. General scheme of brine circuit connection for ecoGEO B1 models.



No	Description	No	Description
1	Heat pump	5	Strainer
2	Brine outlet, (G1'' H)	6	Brine filling fitting
3	Brine inlet, (G1'' H)	7	Expansion vessel
4	Shut-off valve	8	Safety valve

Figure 6.5. General scheme of brine circuit connection for ecoGEO B2 and B3 models.

7. ELECTRICAL INSTALLATION

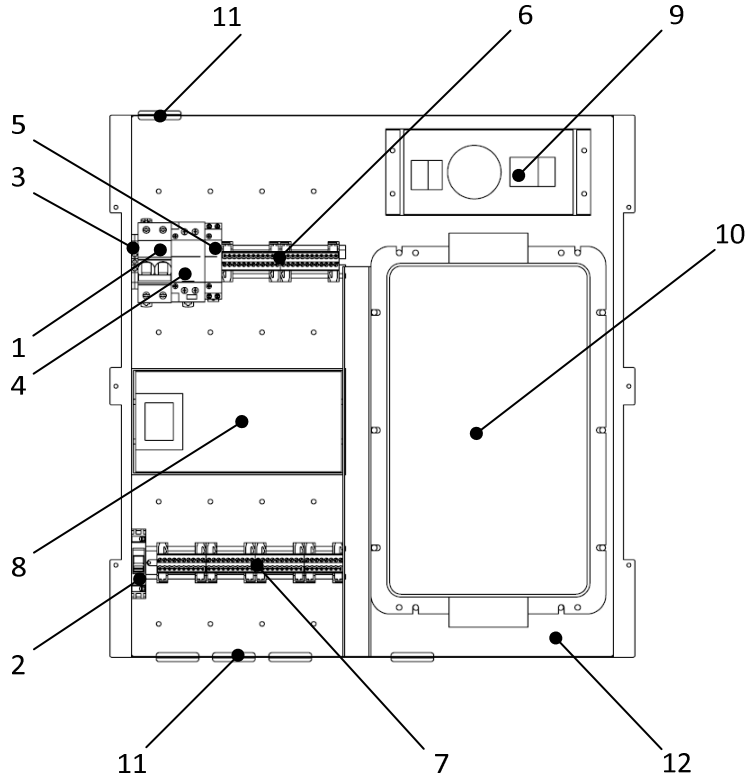
DANGER!

- To carry out the installation and maintenance work on the heat pump, it is necessary to install an external breaker that shuts off all circuits, as personal injury due to electrical shock could occur.

NOTE

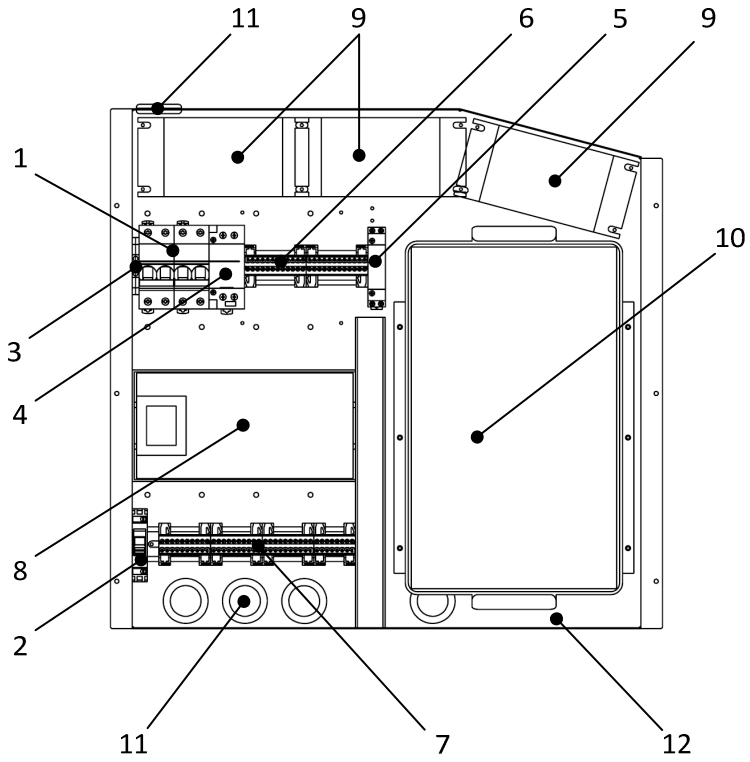
- The power cord should be connected only to the terminals indicated. Otherwise, the equipment may malfunction.

The electrical installation of the heat pump must be carried out by a qualified installer in accordance with the applicable local regulations and these instructions. Figure 7.1 and Figure 7.2 show the location of the main components of the electrical panel of heat pumps with single-phase and three-phase power supply, respectively.



No	Description	No	Description
1	Power breaker	7	Lower terminal block
2	Control breaker	8	Micro-controller
3	Ground terminal	9	EMI Filter
4	Inverter / compressor contactor	10	Inverter
5	Legionella protection contactor	11	Cable grommet
6	Upper terminal block	12	Housing

Figure 7.1. Location of components of the electrical panel of heat pumps with single-phase power supply (230 V / 50 Hz, 1/N/PE~).



No	Description	Nor	Description
1	Power breaker	7	Lower terminal block
2	Control breaker	8	Micro-controller
3	Ground terminal	9	Choke Filters
4	Inverter / compressor contactor	10	Inverter
5	Legionella protection contactor	11	Cable grommet
6	Upper terminal block	12	Housing

Figure 7.2. Location of components of the electrical panel for heat pumps with three-phase power supply (400 V / 50 Hz, 3/N/PE~).

The internal components of the heat pump are connected to the electrical panel with terminal blocks for quick standing connections. For more detailed information about the electrical panel connections, see sections 12.3 to 12.5.

The electrical installation necessary to use the heat pump is only the power cord connection, control signals, external temperature probes and external control valves.

7.1. POWER SUPPLY

Depending on the model, the heat pump may require single-phase 230 V / 50 Hz, 1/N/PE ~ or , three-phase 400 V / 50 Hz, 3/N/PE ~ power supply. To carry out the electrical installation, follow the following steps.

1. Insert the power cord through the cable grommet located at the bottom of the rear cover of the heat pump. In order to do this, it is necessary to remove the front and side covers (see section 3.5).
2. Lead the cable through the cable grommet located at the left top of the electrical panel, fixing the cable properly to the structure.
3. Connect the power supply cord following Figure 7.3 in single-phase models and following Figure 7.4 in three phase models (see also sections 12.3 to 12.5).

4. It is recommended to install an external breaker that shuts off all circuits (1 phase + neutral in single-phase models and 3 phase + neutral in three phase models).

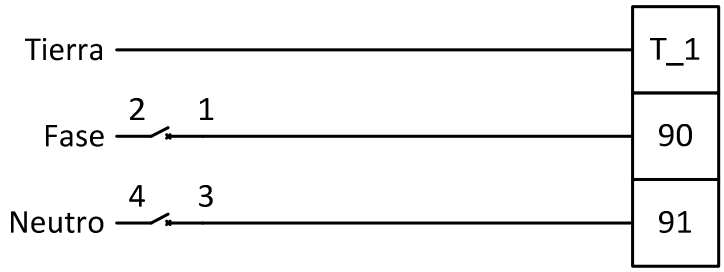


Figure 7.3. Connection diagram of the power supply in single-phase models.

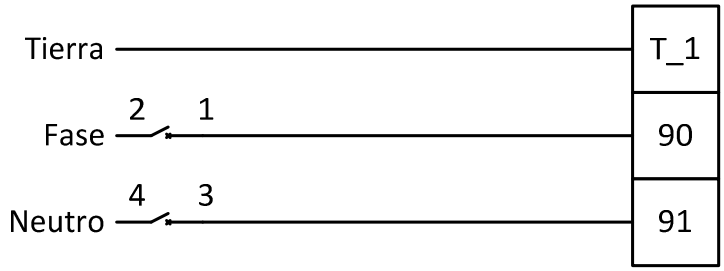


Figure 7.4. Connection diagram of the power supply in three-phase models.

Table 7.1 shows the sections necessary for the power cord and the minimum current for which the external switch must be selected.

Model	Power supply	Cable section	External breaker
ecoGEO B 3-12 kW	Single-phase	6 mm2	32 A
ecoGEO B 5-22 kW	Single-phase	10 mm2	40 A
ecoGEO B T 5-22 kW	Three-phase	4 mm2	16 A

Table 7.1. Cable and external breaker sizing.

7.2. ZONE 1 VALVE

The heat pump allows activating/deactivating an external On/Off zone valve with 230 Vac power supply to cut the flow through Zone 1 of the heating-cooling circuit when there is no demand in this zone. Make the hydraulic installation in such a way that the valve opens/closes when energized/de-energized. In order to make the electrical installation, follow Figure 7.5 (see also sections 12.3 to 12.5).

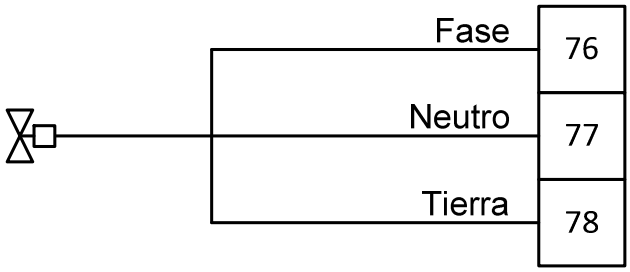
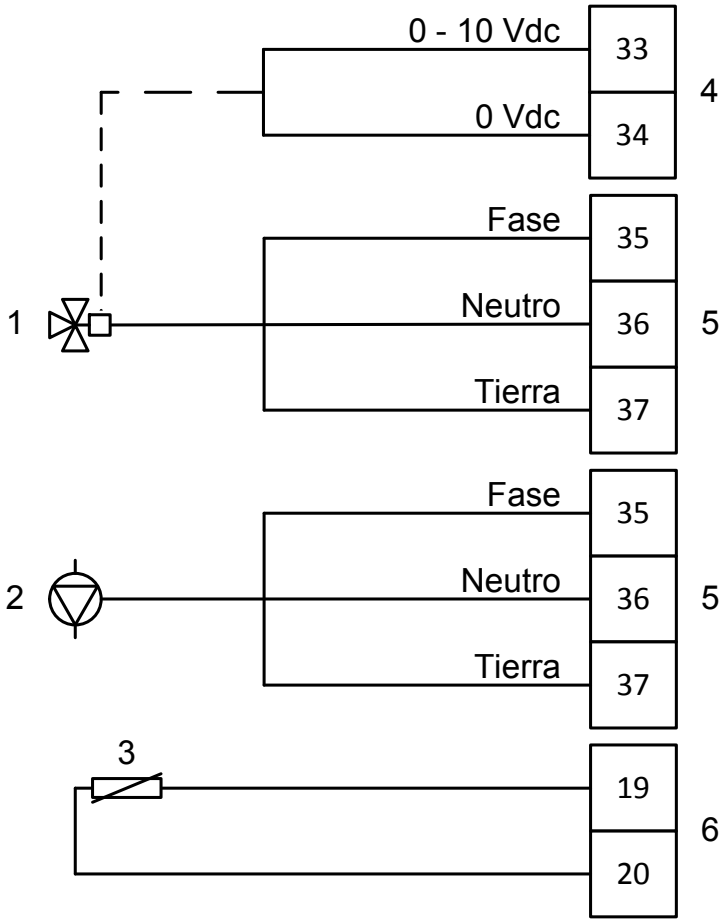


Figure 7.5. Connection diagram of Zone 1 valve to the electrical panel.

7.3. EXTERNAL SHUNT GROUP FOR ZONE 2

The heat pump allows controlling an external shunt group to produce a second outlet temperature level through a modulating 3-way valve with 0-10 Vdc signal. Make the hydraulic installation in such a way that the 0 Vdc signal corresponds to 0% of recirculation (0% bypass) and 10 Vdc to 100% recirculation (100% bypass). In order to make the electrical installation, follow Figure 7.6 (see also sections 12.3 to 12.5).



Nor	Description	Nor	Description
1	Modulating 3-way valve	4	Analogue output 0-10 V
2	Circulation pump	5	Relay output (230 Vac)
3	Outlet temperature probe	6	Analogue NTC input

Figure 7.6. Connection diagram for the external shunt group of Zone 2 to the electrical panel.

7.4. OUTDOOR TEMPERATURE PROBE

The outdoor temperature probe is connected through a two-pole cable to the lower terminal block of the electrical panel, as shown in Figure 7.7 (see also sections 12.3 to 12.5). In order to install the temperature probe, follow these recommendations.

1. Install the outdoor temperature probe towards the north or northeast wall of the house.
2. Place the probe in a well-ventilated place sheltered from the wind and the rain.
3. Do not install the outdoor temperature probe within a distance less than 1 m from windows or doors in order to avoid the possible effect of warm air currents.
4. Use a cable of 50 m maximum length and a minimum section of 0.75 mm^2 for connecting the probe. For longer lengths (up to 120 m) it is recommended to use 1.5 mm^2 cable.

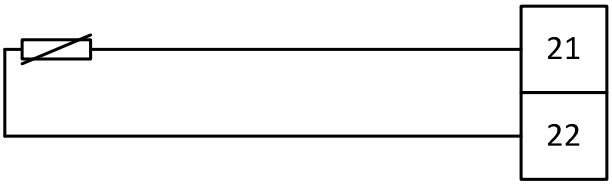
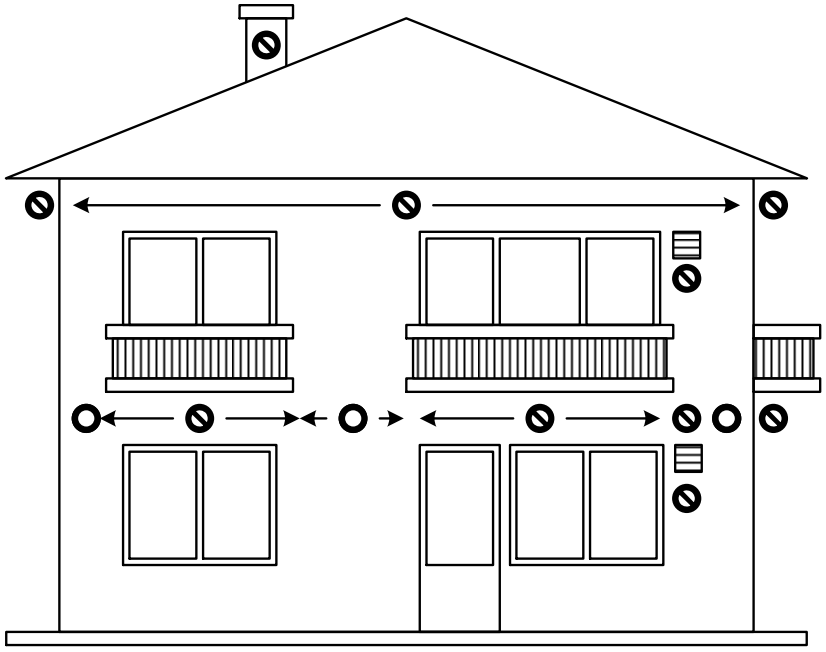


Figure 7.7. Connection diagram for the outdoor temperature probe to the electrical panel.



Icon	Description
○	Recommended location for installation
⊘	Not recommended location for installation

Figure 7.8. Recommended locations for installing the outdoor temperature probe (north facade).

7.5. TEMPERATURE PROBE AND LEGIONELLA PROTECTION ELECTRIC HEATER OF THE EXTERNAL DHW TANK

The temperature probe of the DHW tank is connected through a two-pole cable to the lower terminal block at the electrical panel, while the legionella protection electric heater is connected to upper terminal block , as shown in Figure 2.1

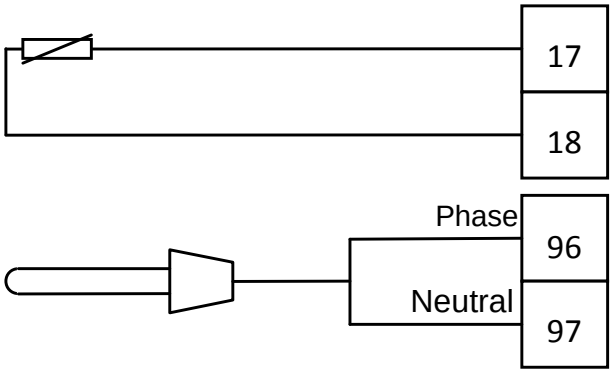


Figure 7.9. DHW tank connection schema.

7.6. BUFFER TANK TEMPERATURE PROBE

The buffer tank temperature probe is used only in the scheme BUFFER TANK. It is connected through two-pole cable to the lower terminal block of the electrical panel, as shown in Figure 7.10 (see also sections 12.3 to 12.5).

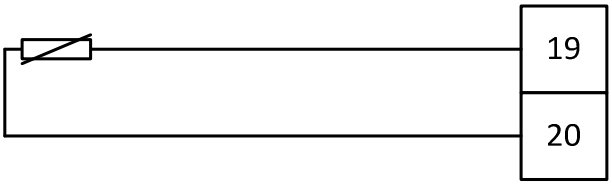
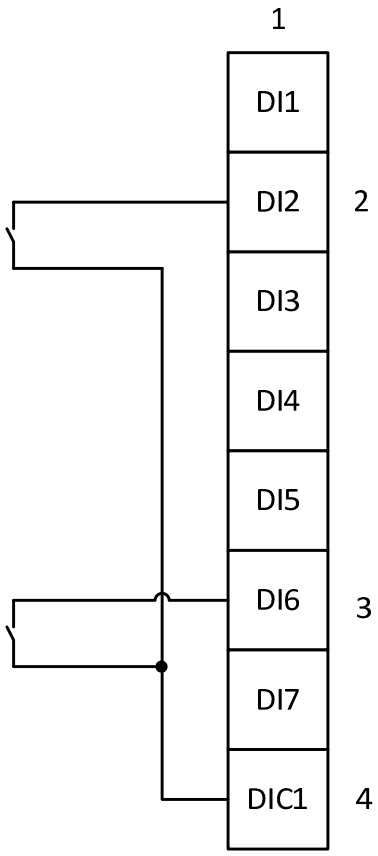


Figure 7.10. Connection diagram of the buffer tank temperature probe.

7.7. EXTERNAL ACTIVATION OF THE HEAT PUMP

The heat pump can be activated/deactivated through a external voltage- free signal. This signal is connected directly to the micro-controller through connector J4, as shown in Figure 7.11 (see also sections 12.3 to 12.5).



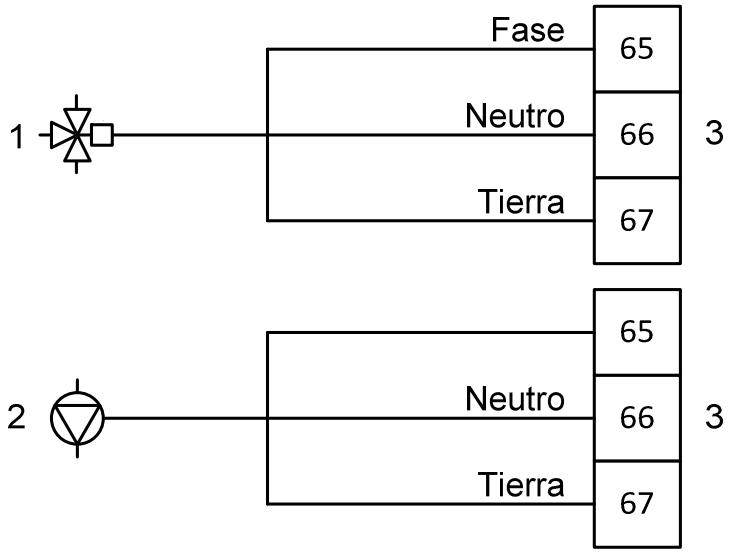
No	Description	No	Description
1	Micro-controller connector J4	3	Pool activation
2	External activation signal of the heat pump	4	Common digital inputs

Figure 7.11. Connection diagram of the external activation signal of the heat pump and pool mode activation.

7.8. POOL VALVE

The heat pump allows controlling the activation of an external pump, as well as a 3-way valve to deviate the heating flow to the pool heat exchanger. To that end, it is required a voltage-free signal that informs the heat pump whenever there is demand of heating the pool, generally from a cronothermostat. This signal is directly connected to the micro-controller through the J4 connector, as shown in Figure 7.11 (see also sections 12.3 to 12.5).

In order to make the power installation, follow Figure 7.12 (see also sections 12.3 to 12.5).



No	Description	No	Description
1	3-way deviation valve to pool On/Off	3	Relay output (230 Vac)
2	Pool circulation pump		

Figure 7.12. Connection diagram of the circulation pump and the pool valve to the electrical panel.

8. INDOOR CONTROL DEVICES

NOTE

- In order to get the best indoor comfort services and optimize the energy efficiency of the heat pump, it is recommended to make an indoor control through indoor th-Tune terminals.
- Indoor th-Tune terminals and conventional relay type thermostats for controlling the heat pump cannot be used simultaneously.
- In installations with scheme BUFFER TANK, indoor th-Tune terminals should not be habilitated.
- The activation signals of the heat pump, control with thermostats and the pool control (DI1 to DI6 inputs) must be **voltage-free contacts**.

Geothermal pumps ECOFOREST can be controlled, through indoor terminals with Modbus connection or through conventional relay type thermostats. With both options, the heat pump allows controlling 1 or 2 different outlet temperatures (hereinafter Zone 1 and Zone 2), depending on the selected operating scheme and installation.

8.1. TH-TUNE INDOOR TERMINALS

ECOFOREST geothermal pumps are programmed to be used with Carel th-Tune indoor terminals, although they can also be used with any other terminal with Modbus connection. These terminals send information about the indoor temperature and humidity of the room. It is necessary to install one terminal in 1 ZONE installations and two in 2 ZONES installations. These should be located in the most representative part of each zone, generally in the larger one, for example, in the living room. The heat pump takes de temperatures registered by the th-Tune terminals as reference in order to make a precise control of the indoor temperature.

To install the th-Tune terminal, it is necessary to connect the power supply and the RS485 serial cable. Before installing, take into account the following recommendations.

1. Before connecting the power supply terminal, carefully read the instructions included in the Th-Tune manual. Check that the supply voltage is correct. There are models with 24 Vac/Vdc and 230 Vac.
2. To connect the RS485 serial port use AWG type 20-22 two-pole shielded cable. For cable lengths exceeding 500 m, it is necessary to install a 120 Ohm resistance between Rx+/Tx+ and Rx-/Tx- in the first terminal and in the last one in order to prevent possible communication problems. For more information, see the Th-Tune manual.

The RS485 serial cable connection is made directly to the card installed in the micro-controller BMS connector, as shown in Figure 8.1 (see also sections 12.3 to 12.5). 1 or 2 terminals can be connected depending on the fact of how many different outlet temperatures are controlled (1 or 2).

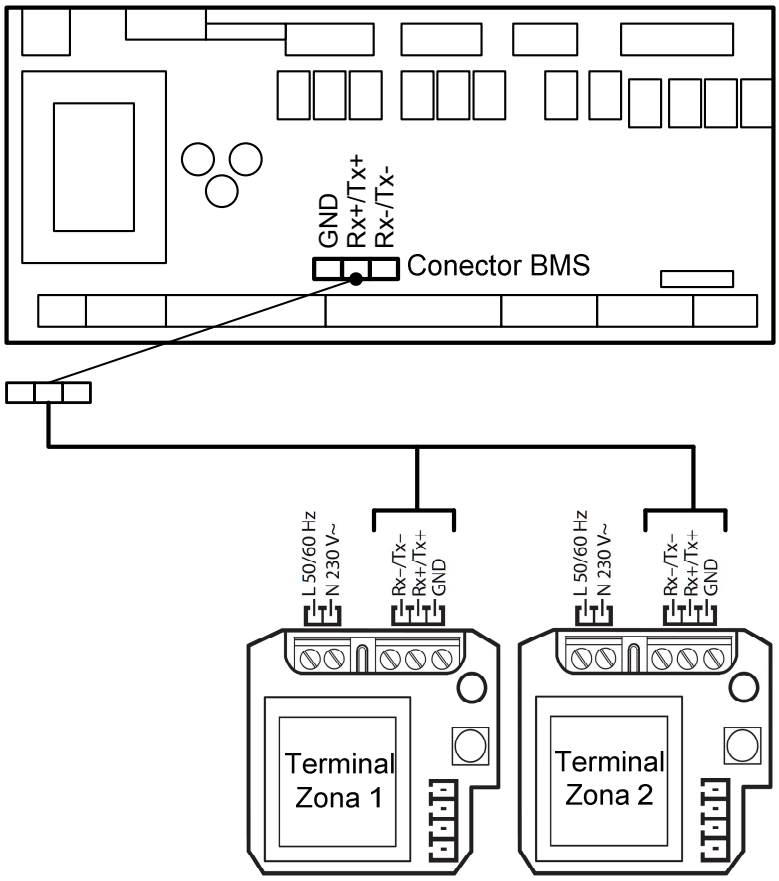
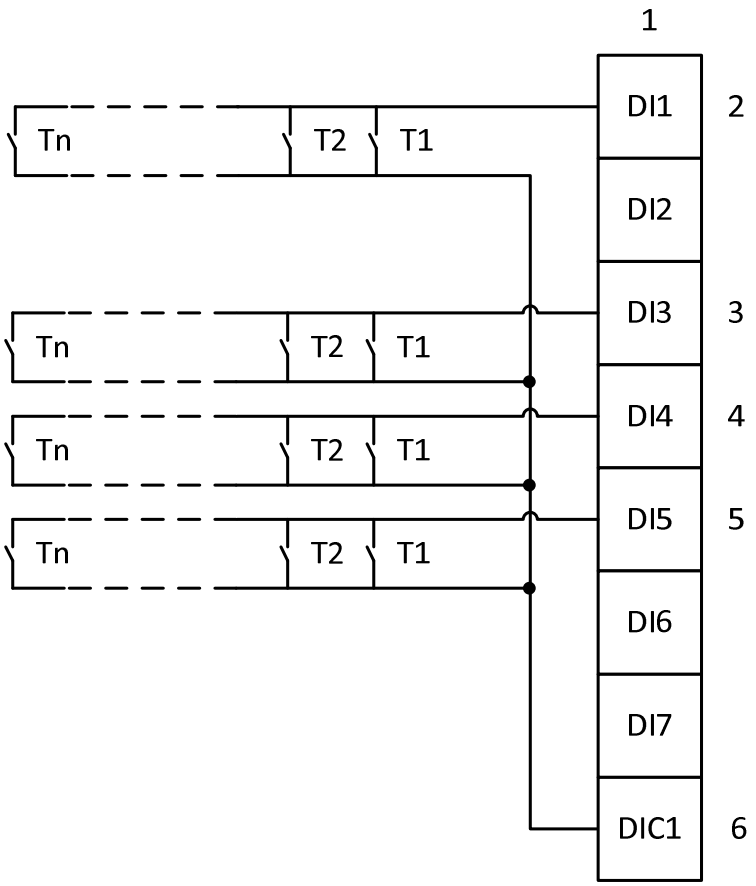


Figure 8.1. Connection diagram of the RS485 serial cable to the electrical panel.

Configure the address of the th-Tune terminals according to the configuration established in the application of the heat pump (see section 4.6, menu 2.4.3). You can find more detailed information about the installation and operation of the terminal in the th-Tune manual.

8.2. CONVENTIONAL RELAY THERMOSTATS

ECOFOREST geothermal pumps can be controlled through one or various conventional relay thermostats, allowing the switching on/off of the heat pump according to heating demand of the house. For this reason, it has 4 digital independent inputs, 2 dedicated to the heating demand of each of the zones with different outlet temperature, and 2 dedicated to the cooling demand in each of the zones with different outlet temperature (only in models ecoGEO B2 and B3). Each of these control signals derives from one or various thermostats. If more than one thermostat is used per signal, these must be connected in parallel in such a way that if only one of them is active, this can be detected by the heat pump. The input signals are connected directly to the micro-controller through the J4 connector, as per 8.2 (see also sections 12.3 to 12.5).



No	Description	No	Description
1	Micro-controller J4 connector	4	Heating activation Zone 2
2	Heating activation Zone 1	5	Free/Active cooling activation Zone 2
3	Free/Active cooling activation Zone 1	6	Common digital inputs

Figure 8.2. Connection diagram of thermostat signals to the micro-controller.

9. FILLING THE CIRCUITS

Before configuring and starting up the equipment, it is necessary to fill, purge and pressurize properly all the circuits of the heat pump. In order to do that, follow the steps of the following sections.

9.1. FILLING THE HEATING/COOLING CIRCUIT

DANGER!

- During the filling of the heating/cooling circuits, special care must be taken to avoid getting water on the electrical panel as this could produce personal injury from electrical shock and/or make the equipment malfunction.

NOTE

- Do not add antifreeze or anti-corrosion additives to the heating/cooling system fluid as this may damage the seals and other components and cause leaking.
- Before filling the heating/cooling circuit, it is convenient to carry out the electrical installation so that the heating/cooling circuit pump can be used.

To fill the heating-cooling circuit, use water only. Before starting the heat pump, make sure the air contained in the heating-cooling circuit has been completely purged, its pressure is suitable and there are no leaks in the circuit.

In order to facilitate the filling of the heating-cooling circuit, it may be convenient to activate the heating pump. In order to do so, access INSTALLER MENU -> CONFIGURATION -> ACT. MANUAL COMPO. -> HEATING/COOLING PUMP -> State, switch value to ON.

To drain the heating-cooling circuit completely, the heat pump has a drain valve at the lowest part of the circuit, just under the heating-cooling circulation pump (see section 3.4).

9.2. FILLING THE DHW COIL CIRCUIT

DANGER!

- During the process of filling the DHW circuit, be very careful that water does not drop on the electrical board. It may cause personal injury due to electrocution and/or provoke the equipment malfunction.

NOTE

- Do not add anti-corrosion or anti-freezing additives to water in the DHW buffer coil circuit. Joints or other components may be damaged a leak provoked.

The circuit of the DHW external buffer coil is connected to the climate control circuit. For this reason, the filling of this circuit must be simultaneously accomplished with the filling of the climate control circuit. To do it, open the manual or automatic deaerators which are installed in the circuit that connects the heat pump to the DHW buffer coil until be sure that the circuit is completely empty of air.

If the above mentioned process does not guarantee that the circuit is completely empty of air, you may need to activate manually the circulator pump of the coil circuit. In ecoGEO B1 and B2 models, activate manually on several occasions the 2 way climate control/DHW valve (INSTALLER MENU-> CONFIGURATION -> MANUAL TEST -> DHW VALVE -> State, change value to ON) while the heating-cooling circulator pump is activated until being sure of a proper deaeration of the coil. In ecoGEO B3 models activate manually the DHW circulator pump (INSTALLER MENU-> CONFIGURATION -> MANUAL TEST-> DHW PUMP -> State, change value to ON).

In ecoGEO B1 and B2 models, the circuit emptying of the buffer coil is accomplished together with the heating-cooling circuit through the emptying valve placed below the heating-cooling pump (see section 3.4).

To empty the circuit of the buffer coil in ecoGEO B3 models, use the valve placed just below the DHW circulator pump (see section 3.4).

9.3. FILLING THE BRINE CIRCUIT

DANGER!

- During the filling of the brine circuit, special care must be taken to avoid getting antifreeze mixture on the electrical panel as it may cause personal injury from electric shock and/or cause equipment malfunction.

NOTE

- Before filling the brine circuit, it is necessary to complete the electrical installation so that the brine pump can be activated.
- Check the local regulations before using any kind of antifreeze mixture.

The brine system temperature may drop below 0 ºC, so a mixture of water antifreeze with a freezing point around -17 ± 2 ºC should be used. It is recommended to use a propylene glycol antifreeze (max. 33% by volume) or ethylene glycol (max. 30% by volume) with corrosion inhibitor.

The estimated volume of the antifreeze mixture required to fill the brine circuit must be calculated taking into account the following.

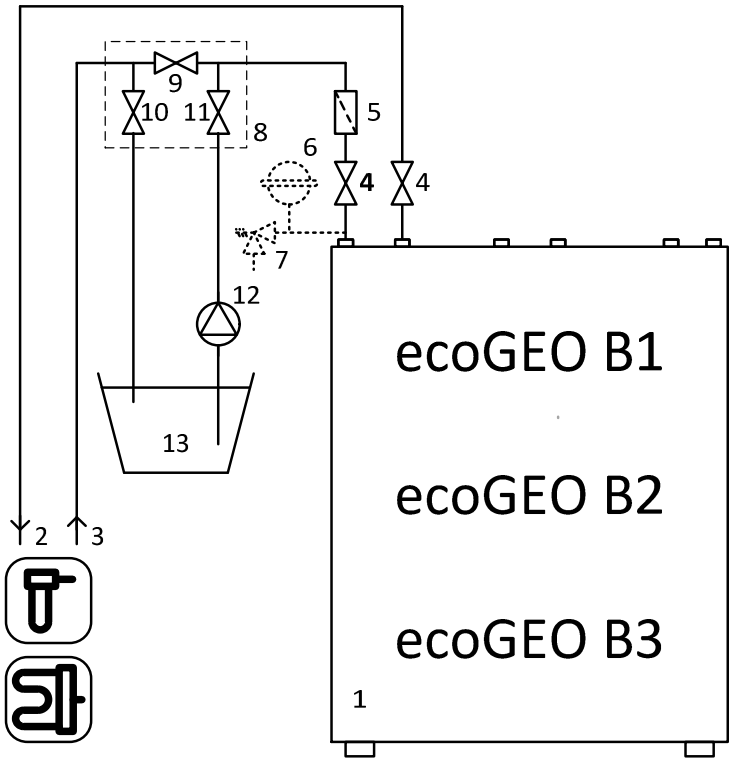
- Heat pumps (exchangers + pipes + expansion vessel, 5 litres).
- Brine pipe per lineal meter. It is not recommended to use pipes with diameters lower than those shown in Table 9.1 as the high speeds of circulation of liquid may cause noise and corrosion problems.

Type of piping	Inner diameter (mm)	Volume (l/m)
PEM DN 40	36	1
PEM DN 32	28	0.6
Cooper 28	25.6	0.5

Table 9.1. Volume calculation per lineal meter of pipe.

Filling the brine circuit must be done through an external filling pump, as indicated in Figure 9.1, following these steps.

1. Prepare the antifreeze mixture in properly concentration in the external tank (11).
2. Connect the outlet port of the filling pump (10) to the filling valve C (9).
3. Connect a transparent hose from the filling valve B (8) to the external antifreeze tank so that its end is immersed.
4. Close the filling valve A (7).
5. Open the filling valves B and C.
6. Activate the external filling pump to fill the circuit.
7. Activate in manual mode the brine circuit pump (INSTALLER MENU -> CONFIGURATION -> MANUAL TEST -> BRINE PUMP -> State, switch the value to ON) in order to facilitate the circulation of the antifreeze mixture through the circuit.
8. Keep the external filling pump and the brine pump running until no air bubbles are seen in the fluid that goes through the transparent hose to the antifreeze mixture tank.
9. Deactivate in manual mode the brine circuit pump (INSTALLER MENU -> CONFIGURATION -> MANUAL TEST -> BRINE PUMP -> State, switch the value to OFF).
10. Open the filling valve A, maintaining the external filling pump connected in order to eliminate the air contained between filling valves B and C.
11. Close the filling valve B and pressurize the brine circuit up to the service pressure through the filling pump.
12. Close the filling valve C.
13. Disconnect the external filling pump and the rest of the filling components.



Nº	Description	Nº	Description
1	Heat pump	8	Brine filling fitting
2	Brine outlet	9	Filling valve A
3	Brine inlet	10	Filling valve B
4	Shut-off valve	11	Filling valve C
5	Strainer	12	External filling pump
6	Expansion vessel	13	External antifreeze mixture tank
7	Safety valve		

Figure 9.1. Brine circuit filling.

To drain the brine circuit, the heat pump has a drain valve in the lower point of the outlet pipe (see section 3.4).

10. SETTINGS AND START UP

Before starting up the heat pump, it will be necessary to set it in order to work with the heating-cooling system used and to define the main working parameters.

To set up the equipment, power the heat pump by the external switch. Don't forget to turn on the heat pump and the front panel. It will be necessary to drive the internal power switches (upper terminal block) and control (lower terminal block). Once powered the heat pump, wait until the initial screen appears on front panel and follow the next steps.

10.1. SELECTING THE FRONT PANEL LANGUAGE

Access INSTALLER MENU (press [Prg]+[Esc] and enter the installer password PW1) -> LANGUAGE and select the front panel language.

10.2. SELECTING THE HEAT PUMP MODEL

Access INSTALLER MENU (press [Prg]+[Esc] and enter the installer password PW1) -> CONFIGURATION -> HEAT PUMP MODEL and select the model ecoGEO used from the available options.

10.3. ENABLING DIGITAL INPUT FOR EXTERNAL ACTIVATION

Access INSTALLER MENU (press [Prg]+[Esc] and enter the installer password PW1) -> CONFIGURATION -> EXTERNAL ACTIVATION, select ON/OFF the input DI2. If you also enable the external activation, select the type of control logic among the options NO and NC (normally open/normally closed).

10.4. SELECTING THE WORKING SCHEME

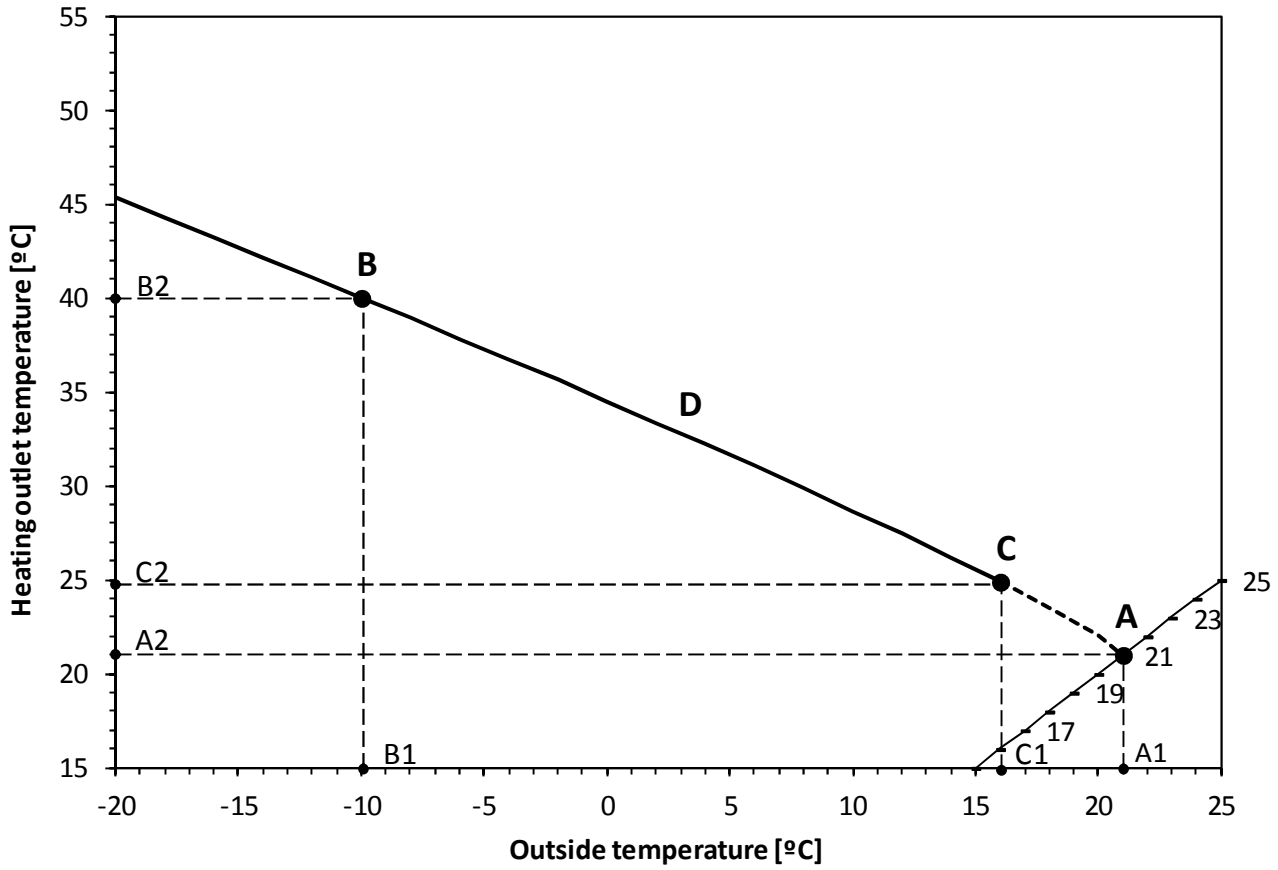
Access INSTALLER MENU (press [Prg]+[Esc] and enter the installer password PW1) -> CONFIGURATION -> SCHEME/DHW/POOL.

1. On OPERATION SCHEME screen select the type of installation that is connected to the heat pump among the options 1 ZONE / 2 ZONE / BUFFER TANK.
   - 1 ZONE for installations with the heat pump directly connected to the heating-cooling system supplying one temperature level (1 Zone).
   - 2 ZONES for installations with the heat pump directly connected to the heating-cooling system supplying two different temperature levels controlled by the heat pump (2 Zones).
   - BUFFER TANK for installations with heat pump connected to an intermediate buffer tank between the heat pump and the heating-cooling system.
2. On the screen DHW, select ON/OFF the DHW mode.
3. On the screen POOL, select ON/OFF the POOL mode. By setting POOL mode also set the outlet set point temperature of the heat pump and the minimum time for POOL mode to an heating-cooling demand. This screen is only available in the 1 ZONE and 2 ZONE schemes with ecoGEO B1 and B2 models. In ecoGEO B3 models is available for all schemes.

10.5. SETTING THE HEATING CURVE

Access INSTALLER MENU (press [Prg] + [Esc] and enter the installer password PW1) -> CONFIGURATION -> HEATING CURVE and set the parameters needed to define the outlet temperatures of the heat pump, both in HEATING and ACTIVE COOLING mode.

The outlet temperature in HEATING mode is given by the heating curve, which is set by the inside and outside design points, the heating stop point, the type of emitting system and the building insulation. Figure 10.1 shows a diagram with the parameters used to adjust the heating curve.



Nº	Description	Nº	Description
A	Inside design point (DPI)	B2	Outlet temperature for the DPE.
A1	Inside design temperature	C	Heating stop point (PCC)
A2	Outlet temperature for the DPI.	C1	Heating stop temperature.
B	Outside design point (DPE)	C2	Outlet temperature for the PCC.
B1	Outside design temperature	D	Heating curve

Figure 10.1. Adjusting the parameters to define the heating curve.

Table 10.1 shows the recommended values for each emitting system.

Parameter	Emission system	Recommended value	Remarks
Inside design temperature	-	21 – 23ºC	Regulations on Building Heating Installations
Outside design temperature	-	-	UNE 100001:2001
Outlet temperature for the outside design point	Under-floor	30 – 35ºC	Technical Committee CEN/TC 228
	Fancoils/convectors	40 – 45ºC	
	Low temperature radiators	45 – 50 ºC	
Slope heating curve	-	1,00	-

[1] Minimum ambient temperature for working installation. Depending on the locality in which the installation is located.

Table 10.1. Recommended values for the adjustment parameters of the heating curve.

Outlet temperature in ACTIVE COOLING mode depends on the emitting system used and whether the control of the heat pump is performed by th-Tune terminals or relay thermostats.

1. On the screen HEATING/COOLING STOPS adjust the maximum/minimum outside temperatures to which disables the heating/cooling production.
   - In ecoGEO B1 models, adjust the maximum outside temperature value above which disables the heating production (16 ºC by default).
   - In ecoGEO B2/B3 models, in addition to the above, adjust the minimum outside temperature value below which disables the active cooling/free cooling production (28 ºC by default).
2. On the screen INSIDE PARAMETERS adjust the inside design temperature of the heating system (21º C by default). For the outlet temperature of the heat pump at this point it's taken automatically a value equal to the inside design temperature. If you selected the BUFFER tank scheme you don't need to set up the parameters shown on this screen.
3. On the screen OUTDOOR PARAMETERS adjust the outside design temperature of the heating system (-1º C by default). Set as well the outlet temperature to the heating system at this point.
   - If you selected the 1 ZONE scheme, set the outlet temperature to the heating system in the design conditions.
   - If you selected the 2 ZONE scheme, set the outlet temperature to Zone 1 (higher temperature) and to Zone 2 (lower temperature, external shunt group), in the design conditions.
   - If you selected the BUFFER TANK scheme, you don't need to set up the parameters shown on this screen.
4. On the screen HEAT. EMISSION SYSTEM select the type of emitting system of the heating system.
   - If you selected the 1 ZONE scheme, select the type of emitting system among the options HEATING FLOOR / FANCOILS / LOW TEMPERATURE RADIATORS.
   - If you selected the 2 ZONE scheme, adjust the type of emitting system in Zone 1 (outlet to high temperature zone), and in the Zone 2 (outlet to low temperature zone) among the options HEATING FLOOR / FANCOILS / LOW TEMPERATURE RADIATORS.
   - If you selected the BUFFER TANK scheme, you don't need to set up the parameters shown on this screen.

5. On the screen COOL. EMISSION SYSTEM select the type of emitting system of the cooling system.
   - If you selected the 1 ZONE scheme, select the type of emitting system among the options HEATING FLOOR / FANCOILS / LOW TEMPERATURE RADIATORS.
   - If you selected the 2 ZONE scheme, set the type of emitting system in the Zone 1 (outlet to low temperature zone), and in the Zone 2 (outlet to high temperature zone) among the options HEATING FLOOR / FANCOILS / LOW TEMPERATURE RADIATORS.
   - If you selected the BUFFER TANK scheme, you don't need to set up the parameters shown on this screen.
6. On the screen INSULATION select the grade of building insulation among the options GOOD / MODERATE / BAD. If you selected the BUFFER TANK scheme, you don't need to set up the parameters shown on this screen.
7. On the screen COOLING SETPOINT adjust the outlet temperature set point in ACTIVE COOLING mode. This screen is only available in ecoGEO B3 models.

Figure 10.2, Figure 10.3 and Figure 10.4 show the heating curves depending on the inside and outside design points for heating systems equipped with under-floor, fancoils and low temperature radiators, respectively.

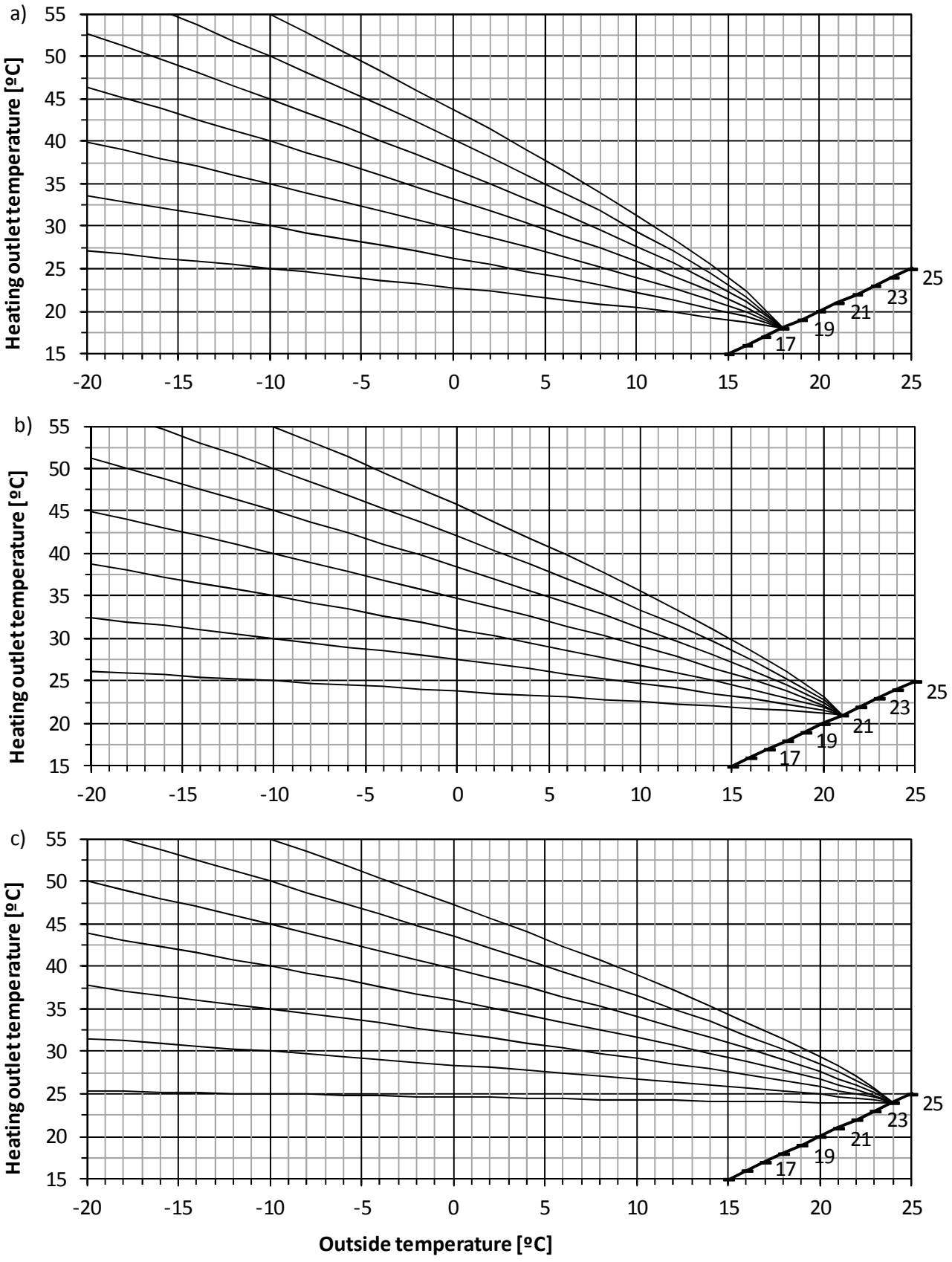


Figure 10.2. Heating curves for heating systems equipped with under-floor and for inside design temperatures at a) 18º C, b) 21º C and c) 24 ºC.

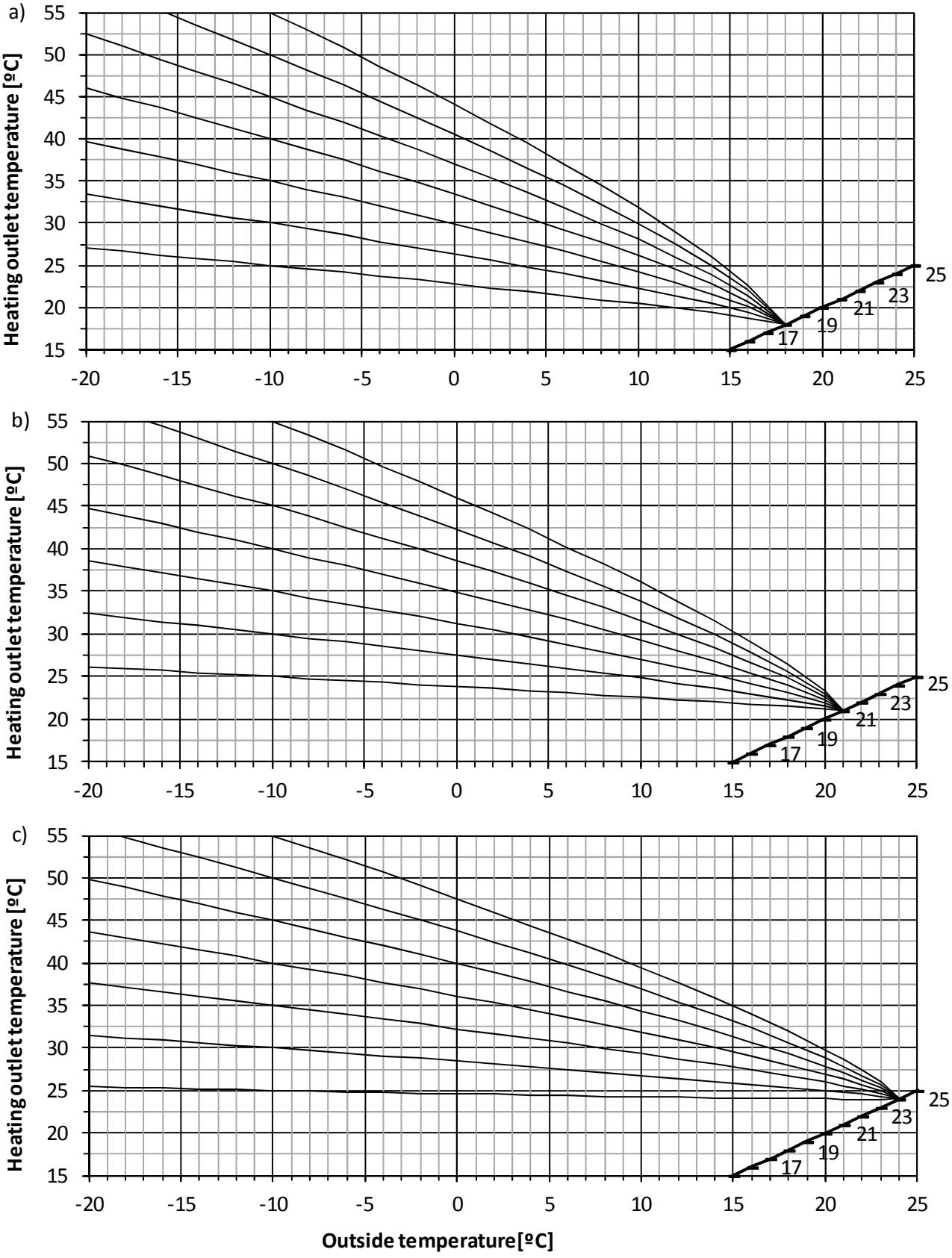


Figure 10.3. Heating curves for heating systems equipped with fancoils and for inside design temperatures at a) 18º C, b) 21º C and c) 24 ºC.

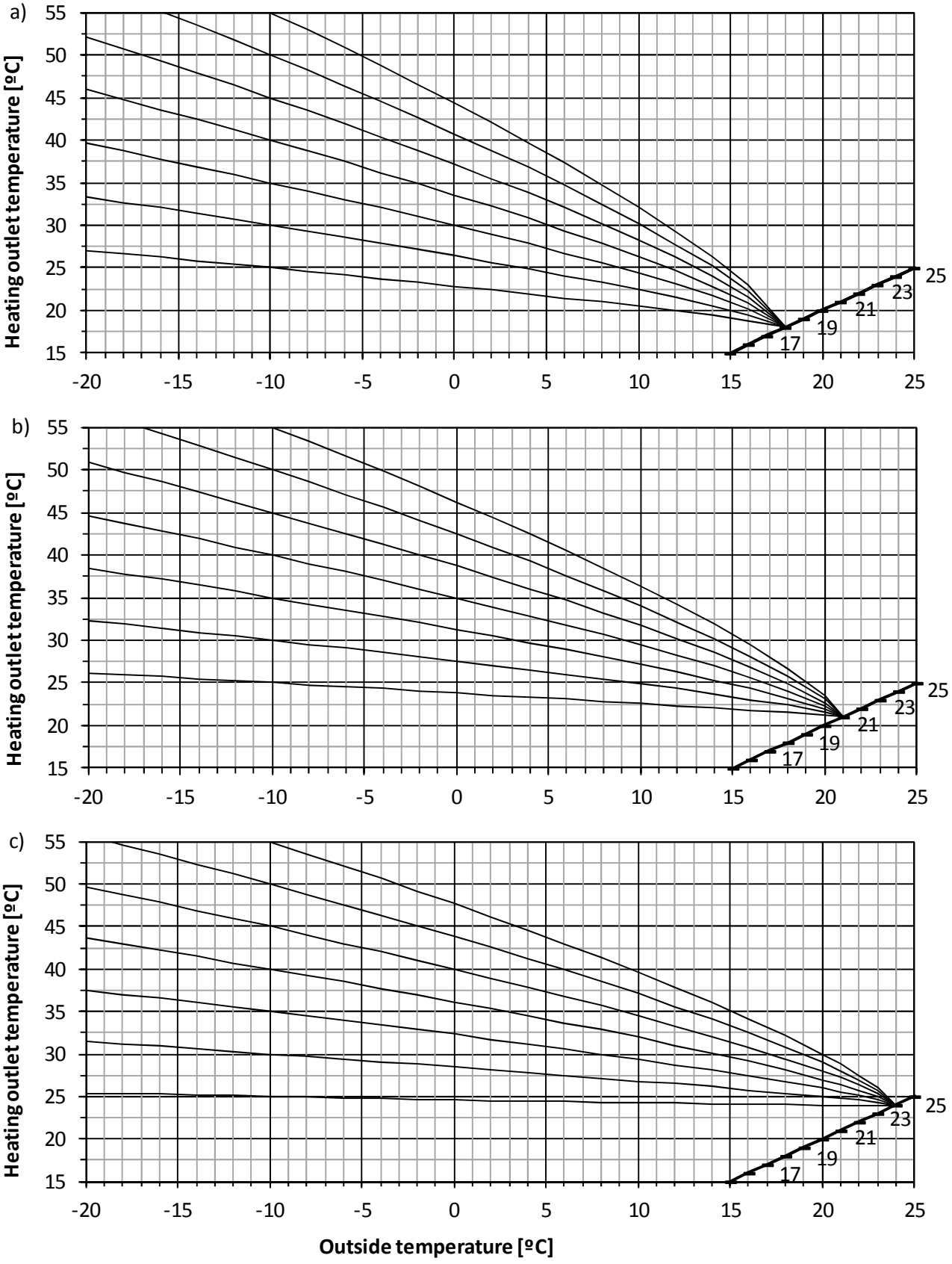


Figure 10.4. Heating curves for heating systems equipped with low temperature radiators and for inside design temperatures at a) 18º C, b) 21º C and c) 24 ºC.

10.6. EXAMPLES OF HEATING CURVE SETTINGS

In the following lines, you have some examples of setting the heating curve depending on the kind of emitting system used and on the design conditions considered for its sizing.

■ EXAMPLE 1

If you want to adjust the heating curve for a house with a heating emitting system by under-floor for the following design conditions:

- The inside room temperature of the house used for system design is about 21 ºC.
- The minimum outside ambient temperature considered in the design is about -6 ºC.
- The outlet temperature leading to the heating system used for under-floor sizing for outside ambient conditions given in the previous section is 35 ºC.
- The maximum ambient temperature above which you want the heat pump does not attend to the heating demand is 16 ºC.

To set the heating curve, adjust the values of the parameters shown in Table 10.2. Figure 10.5 shows the heating curve obtained with such setting up.

Parameter	Values Example 1
Heating stop temperature.	16 ºC
Inside design temperature	21 ºC
Outside design temperature	-6 ºC
Outlet temperature for outside design point	35 ºC
Heat emission system	Under-floor

Table 10.2. Heating curve adjustment for the Example 1.

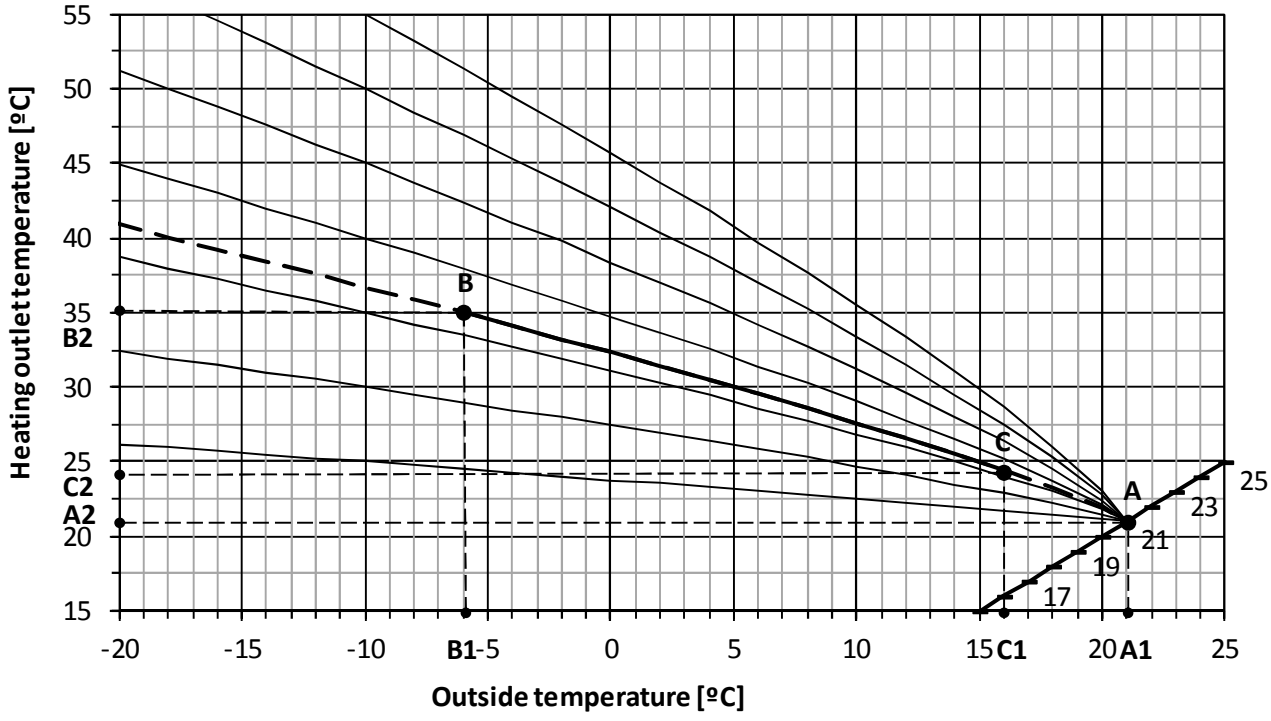


Figure 10.5. Heating curves obtained for parameters in Example 1.

■ **EXAMPLE 2**

If you want to adjust the heating curve for a house with a heating emitting system by fancoils for the following design conditions:

- The inside room temperature of the house used for system design is about 24 ºC.
- The minimum outside ambient temperature considered in the design is about -14 ºC.
- The outlet temperature leading to the heating system used for fancoils sizing for outside ambient conditions given in the previous section is 45 ºC.
- The maximum ambient temperature above which you want the heat pump does not attend to the heating demand is 14 ºC.

To set the heating curve, adjust the values of the parameters shown in Table 10.3. Figure 10.6 shows the heating curve obtained with such setting up.

Parameter	Values Example 2
Heating stop temperature.	14 ºC
Inside design temperature	24 ºC
Outside design temperature	-14 ºC
Outlet temperature for outside design point	45 ºC
Heat emission system	Fancoils

Table 10.3. Heating curve adjustment for the Example 2.

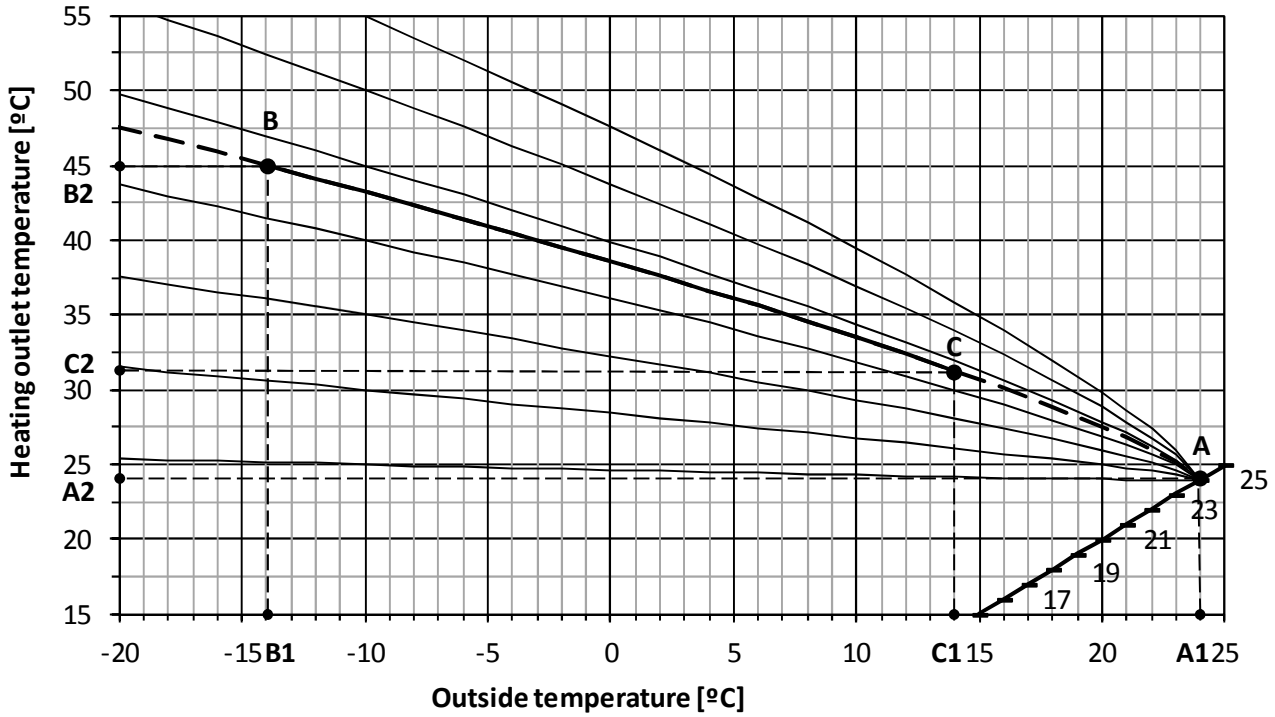


Figure 10.6. Heating curves obtained for parameters in Example 2.

■ **EXAMPLE 3**

If you want to adjust the heating curve for a house with a heating emitting system by low temperature radiators for the following design conditions:

- The inside room temperature of the house used for system design is about 18 ºC.
- The minimum outside ambient temperature considered in the design is about -2 ºC.
- The outlet temperature leading to the heating system used for low temperature radiators sizing for outside ambient conditions given in the previous section is 50 ºC.
- The maximum ambient temperature above which you want the heat pump does not attend to the heating demand is 12 ºC.

To set the heating curve, adjust the values of the parameters shown in Table 10.4. Figure 10.7 shows the heating curve obtained with such setting up.

Parameter	Values EXAMPLE 3
Heating stop temperature	12 ºC
Inside design temperature	18 ºC
Outside design temperature	-2 ºC
Outlet temperature for outside design point	50 ºC
Heat emission system	Low temperature radiators

Table 10.4. Heating curve adjustment for the Example 3.

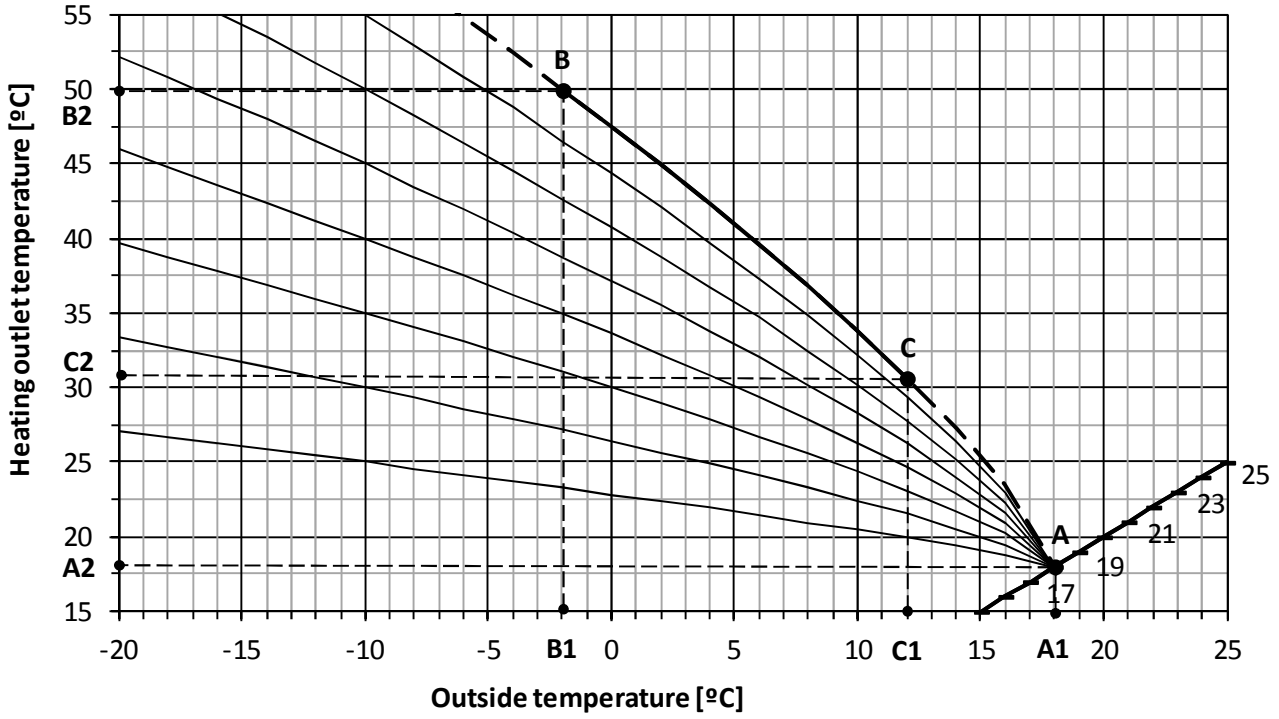


Figure 10.7. Heating curves obtained for parameters in Example 3.

10.7. SELECTING THE INDOOR CONTROL DEVICES

It is possible to control the heat pump by th-Tune inside ambient terminals or by voltage-free contact signals from one or more relay outputs thermostats. Access INSTALLER MENU (press [Prg]+[Esc] and enter the installer password PW1) -> CONFIGURATION -> ROOM TERMINAL.

■ **CONTROL BY TH-TUNE TERMINALS**

1. On the screen TH-TUNE select ON/OFF the control by Th-tune terminals.
   - If you selected the 1 ZONE scheme, adjust the address of the Th-Tune terminal main zone (1 by default).
   - If you selected the 2 ZONE scheme, in addition to the above, adjust the address of the Th-Tune terminal from Zone 2 (2 by default).
2. Adjust in the Th-Tune terminals the same values selected before for each one of the zones. The Th-Tune terminals are set up by default with a address value of 1, thus, if you use the values by default is only necessary modify the address of the Th-Tune terminal from Zone 2.

■ **CONTROL BY RELAY THERMOSTAT SIGNALS**

1. On the screen RELAY THERMOSTATS Z1 select ON/OFF the control by thermostats in the Zone 1. Select as well the control logic of the digital inputs aimed at heating (DI1) and cooling (DI3) among the options NO / NC (normally open/normally closed).
2. On the screen RELAY THERMOSTATS Z2 select ON/OFF the control by thermostats in the Zone 2. Select as well the control logic of the digital inputs aimed at heating (DI1) and cooling (DI3) among the options NO / NC (normally open/normally closed). The screen aimed to the Zone 2 is only available in the 2 ZONE scheme.

10.8. POWER LIMITATION AND SETTING PROTECTIONS

Access INSTALLER MENU (press [Prg]+[Esc] and enter the installer password PW1) -> CONFIGURATION -> PROTECTIONS.

1. On the screen POWER LIMITATION adjust the maximum compressor rotation speed within the range 3100/7000 (6000 rpm by default). The selected value allows limiting the maximum thermal power and the maximum electric consumption of the heat pump (see sections 12.6 and 12.7).
2. On the screen BRINE ALARM, adjust the minimum temperature of the brine circuit below which the heat pump is off (-7 ºC by default).
3. On the screen PRESSURE BRINE/HEATING adjust the minimum pressures in the brine and heating-cooling circuits below which the heat pump is off (1 bar gauge by default).
4. On the screen COOLING OUTLET TEMP, adjust the minimum outlet temperature in ACTIVE COOLING mode below which the heat pump is off (4 ºC by default). This screen is only available in ecoGEO B3 models.

10.9. TEMPERATURE PROBE CALIBRATION

In the temperature probe where the extension cords are used (outdoor temperature probe, external DHW temperature probe, buffer tank temperature probe) the temperature measure can be affected, especially if you use long extension cords, and small sections. Please verify that values provided by the probes where

extension cords are used, comparing with the value provided by a manual meter and, if necessary, adjust the required correction following the next steps.

Access INSTALLER MENU (press [Prg]+[Esc] and enter the installer password PW1) -> CONFIGURATION -> PROBE CONF. On the screen for the probe you want to correct, adjust the required value of the correction.

In the PROBE CONF. menu, you can make corrections for all temperature and pressure sensors. It's recommended only corrections for external temperature probes that have been used with extension cord.

10.10. FINAL INSPECTION AND START UP OF THE INSTALLATION

NOTE

- The initial operation should only be done once after checking the heating-cooling, brine and DHW circuits have been filled and aerated properly.
- Note that if during the operation of the installation, any alarm is activated, may be due to a faulty bleeding of the circuits.
- EcoGEO heat pumps have a program to conduct the floor drying in under-floor installations (see section 4.6).

Before initial operation, check the following points in order to ensure that it have been completed successfully.

- **CHECKING THE HEATING-COOLING, BRINE AND DHW CIRCUITS**

1. The heating-cooling installation was performed according to Figure 6.1, including all components.
2. The DHW installation was performed according to Figure 6.2, including all components.
3. The brine installation was performed according to Figure 6.4, including all components.
4. Flow and return pipes from different circuits have been isolated properly.
5. The heating-cooling and brine circuits have been filled, aerated and pressurized properly.
6. The installation has been checked in order to detect fluids leak.

- **CHECKING THE ELECTRIC INSTALLATION.**

1. The heat pump's power supply installation has been performed according to Figure 7.3 in single-phase models and Figure 7.4 in three-phase models.
2. The electric installation includes an external switch that cuts all circuits.
3. The inside ambient terminals have been correctly positioned and installed.
4. The outside temperature probe has been correctly positioned and installed.
5. The buffer tank temperature probe has been correctly installed (only in installations with intermediate buffer tank).
6. The external shunt group has been correctly installed (only in installations with external shunt group for the second outlet temperature controlled by the heat pump).

■ OPERATION AND INSPECTION OF ABNORMAL NOISES

1. Check the equipment for abnormal noises that indicate possible damages to some components during transport or installation. It is necessary to verify the heat pump in all operating modes (heating production, DHW and active cooling or free cooling where applicable) to ensure that there is no any abnormal noise.
2. Check as well any abnormal noises elsewhere in the installation.

11. IDENTIFYING PROBLEMS AND TROUBLESHOOTING

11.1. ALARM LIST

There are a number of parameters that the heat pump monitors at all moments to verify proper operation of the equipment. If any of these parameters are not within the standard, an alarm is activated to inform the user that there is an abnormal operation of the heat pump. If any alarms are active, the button [Alarm] on the front panel lights up in red and, if you press this button, you can access to the alarm menu (see section 4.5, menu 1.9).

If the cause of the alarm is solved, this one disappears automatically. There are some alarms which if repeated five times consecutive; a permanent alarm is activated, so that the heat pump cannot start until the permanent alarm is erased manually.

Table 11.1 shows the possible alarms and corresponding messages displayed on the front panel.

Alarm Nº	MESSAGE
1	High discharge pressure
2	Low suction pressure
3	Low brine circuit pressure
4	Low heating-cooling circuit pressure
5	High discharge temperature
6	High inverter temperature
7	Low brine outlet temperature
8	Low brine inlet temperature
9	High heating outlet temperature
10	Failure of any temperature probe (indicated on screen the defective probe)
11	Failure of any pressure transducer (indicated on screen the defective transducer)
12	Failure of any inside ambient th-Tune terminal (indicated on screen the defective terminal)
13	Failure of reading temperature in any indoor th-Tune terminal (indicated on screen the defective terminal)
14	Failure of reading humidity in any indoor th-Tune terminal (indicated on screen the defective terminal)
15	Failure of internal clock in any indoor th-Tune terminal (indicated on screen the defective terminal)
16	Incorrect superheat degree

Table 11.1. Alarm list and messages visualized on the front panel.

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11.2. COMFORT PROBLEMS

Table 11.2 shows some of the common comfort problems with which you can find, as well their possible causes and remedies.

Symptoms	Possible cause	Remedy
Too low DHW temperature	High demand on punctual DHW	Wait some hours and then check if the DHW temperature has increased.
	Too low DHW production set point temperature	Increase the DHW production set point temperature (see USER MENU -> DHW/LEGIONELLA PROTECTION -> DHW -> Change set point value)
	Damaged heat pump	Please contact technical support
Too high or too low indoor ambient temperature	Occasional high demand of heating-cooling	Wait some hours and check again the inside ambient temperature
	Defective setup of the heating curve.	Set up correctly the heating curve (See USER MENU -> HEATING -> Decrease/Rise the heating curve)
	The operating program (winter/summer) is incorrect	Select the correct operating program or select the AUTO mode (see USER MENU -> ON/OFF -> ON/OFF ECOGEO 1 -> Change program into AUTO)
	Too high or too low indoor set point temperature	Set up correctly the inside ambient temperature in the th-Tune terminal or in the heat pump front panel
	Damaged heat pump	Please contact technical support
Heat pump not running	The minimum time between starts of the heat pump has not been achieved (20 minutes)	Wait 20 minutes and check if the heat pump run again.
	There are active alarms	Turn off the active alarms (see ALARM MENU - > RESET ALARMS -> Change Reset Alarms to Yes)
	There are active alarms that cannot be turned off	Please contact technical support
	Power breaker is turned off from the electrical panel of the heat pumps.	Rearm the power breaker from the electrical panel of the heat pump.
	Control breaker is turned off from the electrical panel of the heat pump.	Rearm control breaker from the electrical panel of the heat pump.
	The external power supply breaker is turned off	Rearm the power supply breaker from the heat pump
	Damaged heat pump	Please contact technical support

Table 11.2. Identification and comfort troubleshooting.

12. TECHNICAL SPECIFICATIONS

12.1. TECNICAL DATA

In the Table 12.1 you can find the main technical specifications of the heat pumps ecoGEO.

Geothermal heat pumps ecoGEO B TECHNICAL DATA		Unit	ecoGEO B1		ecoGEO B2		ecoGEO B3	
			3-12	5-22	3-12	5-22	3-12	5-22
Application	Heating and ACS	-	●	●	●	●	●	●
	Built-in DHW tank, 170 l	-	●	●	●	●	●	●
	Active cooling	-					●	●
	Built-in free cooling	-			●	●		
Single-phase Power supply	230 V / 50 Hz, 1/N/PE~	-	●	●	●	●	●	●
	Magnetotermal protection	A	32	40	32	40	32	40
Three-phase power supply	400 V / 50 Hz, 3/N/PE~	-		●		●		●
	Magnetotermal protection	A	--	16	--	16	--	16
Refrigerant	Type	-	R410A	R410A	R410A	R410A	R410A	R410A
Components	Compressor	-	Scroll with Copeland inverter					
	Expansion valve	-	Carel Electronics					
	Heat exchangers	-	Alfa Laval Plates					
	Circulation pumps	-	Wilo High- efficiency variable speed (Class A)					
	DHW tank with coil	-	Tank and coil in stainless steel					
	Expansion vessels	-	Heating-cooling circuit and brine circuit					
Efficiency	Heating output[1]	kW	3-15	5-26	3-15	5-26	3-15	5-26
	Heating output[2]	kW	3-14	5-23,5	3-14	5-23,5	3-14	5-23,5
	Electric power consumption[2]	kW	0,7-3,7	1,4-5,5	0,7-3,2	1,4-5,5	0,7-3,2	1,4-5,5
	COP[2]	-	4,6	4,9	4,6	4,9	4,6	4,9
	EER[3]	-	--	--	--	--	6,1-6,9	6,1-6,9
	Cooling capacity[3]	kW	--	--	--	--	4-16,3	6,9-30
	Free cooling capacity	kW	--	--	6	6	--	--
Refrigerant circuit	Refrigerant charge	kg	1,35	1,70	1,35	1,70	1,50	2,00
	Maximum working pressure	bar	42	42	42	42	42	42
	Compressor oil type	-	POE	POE	POE	POE	POE	POE
	Compressor oil charge	kg	1,18	1,18	1,18	1,18	1,18	1,18
Heating-cooling circuit	Maximum/minimum temperature	ºC	60/20					
	Maximum working pressure	bar	3					
	Nominal flow rate	l/h	1200 - 4500					
Brine circuit	Maximum/minimum temperature	ºC	20/-10					
	Maximum working pressure	bar	3					
	Nominal flow rate	l/h	1200 - 4500					
	Recommended antifreeze[5]	-	Propylene glycol/freezing point of water at -17 ±2 ºC					
DHW	Maximum DHW temperature	ºC	50	50	50	50	50	50
	Maximum legionella temperature	ºC	70	70	70	70	70	70
Soundproofing	Noise emission level[4]	dB	54 (40)	54 (40)	54 (40)	54 (40)	54 (40)	54 (40)
Dimensions	Height x width x depth	mm	1800 x 600 x 700					
Weight	Unladen weight (without packaging)	kg	270	275	270	275	275	280

1) According to EN 14511, 5/2 – 30/35 ºC (including circulation pumps, inverter and with single-phase power supply).
2) According to EN 14511, 0/-3 – 30/35 ºC (including circulation pumps, inverter and with single-phase power supply).
3) According to EN 14511, 7/12 – 30/35 ºC (including circulation pumps, inverter and with single-phase power supply).
4) According to EN 14511. Values in parentheses include the compressor's acoustic isolation kit.
5) Please, always check the regional regulations before using the antifreeze.

Table 12.1. Technical specifications of the ecoGEO B heat pumps.

12.2. INTERNAL SCHEMATICS OF THE HEAT PUMPS

Figure 12.1 shows the internal schematic of ecoGEO B1 heat pumps and Table 12.2 shows their main components.

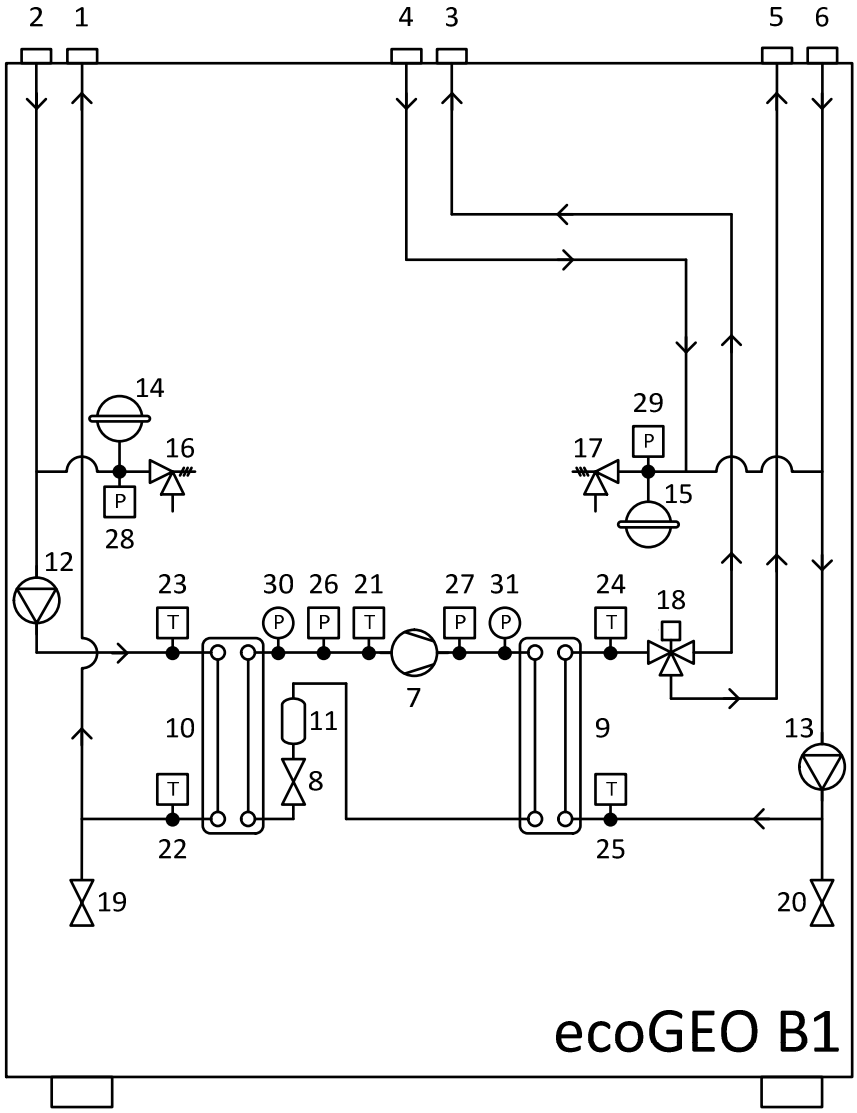


Figure 12.1. Internal schematic of ecoGEO B1 heat pumps.

No	Description	No	Description
1	Brine outlet (G1´´H)	17	Heating safety valve
2	Brine inlet (G1´´H)	18	Heating/DHW 3-way valve
3	Heating outlet (G1´´H)	19	Brine drain valve
4	Heating inlet (G1´´H)	20	Heating drain valve
5	DHW circuit outlet (G3/4´´H)	21	Compressor suction temperature probe
6	DHW circuir inlet (G3/4´´ H))	22	Brine outlet temperature probe
7	Inverter compressor	23	Brine inlet temperature probe
8	Electronic expansion valve	24	Heating outlet temperature probe
9	Condenser	25	Heating inlet temperature probe
10	Evaporator	26	Compressor suction pressure transducer
11	Combi filter dryer	27	Compressor discharge pressure transducer
12	Brine circulation pump	28	Heating circuit pressure transducer
13	Heating circulation pump	29	Brine circuit pressure transducer
14	Brine expansion vessel	30	Low pressure switch
15	Heating expansion vessel	31	High pressure switch
16	Brine security valve		

Table 12.2. Legend of components in the internal schematic of ecoGEO B1 heat pumps.

Figure 12.2 shows the internal schematic of ecoGEO B2 heat pumps and Table 12.3 shows their main components.

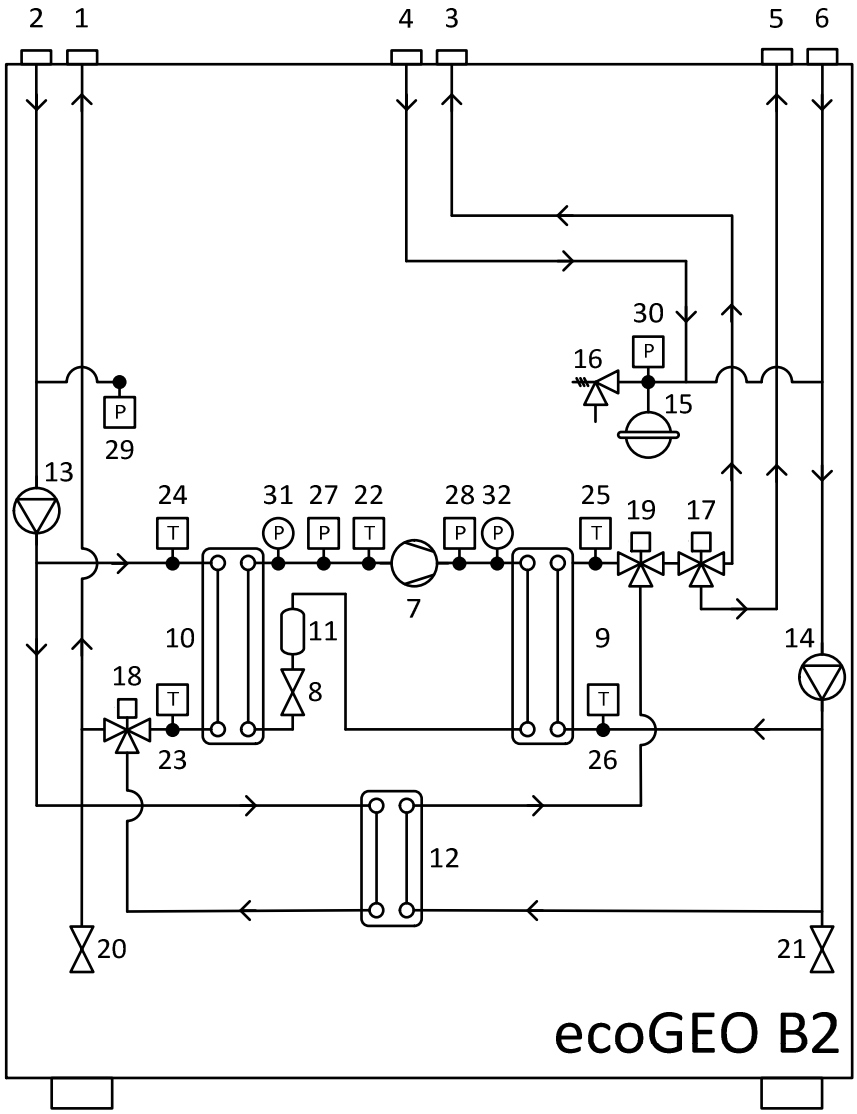


Figure 12.2. Internal schematic of ecoGEO B2 heat pumps.

No	Description	No	Description
1	Brine outlet (G1´´H)	17	Heating/DHW 3-way valve
2	Brine inlet (G1´´H)	18	Free cooling 3-way valve (brine side)
3	Heating-cooling outlet (G1´´H)	19	Free cooling 3-way valve (cooling side)
4	Heating-cooling inlet (G1´´H)	20	Brine drain valve
5	DHW circuit outlet (G3/4´´H)	21	Heating-cooling drain valve
6	DHW circuit inlet (G3/4´´H))	22	Compressor suction temperature probe
7	Inverter compressor	23	Brine outlet temperature probe
8	Electronic expansion valve	24	Brine inlet temperature probe
9	Condenser	25	Heating-cooling temperature probe
10	Evaporator	26	Heating-cooling temperature probe
11	Combi filter dryer	27	Compressor suction pressure transducer
12	Free cooling heat exchanger	28	Compressor discharge pressure transducer
13	Brine circulation pump	29	Brine pressure transducer
14	Heating-cooling circulation pump	30	Heating-cooling pressure transducer
15	Heating-cooling expansion vessel	31	Low pressure switch
16	Heating-cooling security valve	32	High pressure switch

Table 12.3. Legend of components in the internal schematic of ecoGEO B2 heat pumps.

Figure 12.3 shows the internal schematic of ecoGEO B3 heat pumps and Table 12.4 shows their main components.

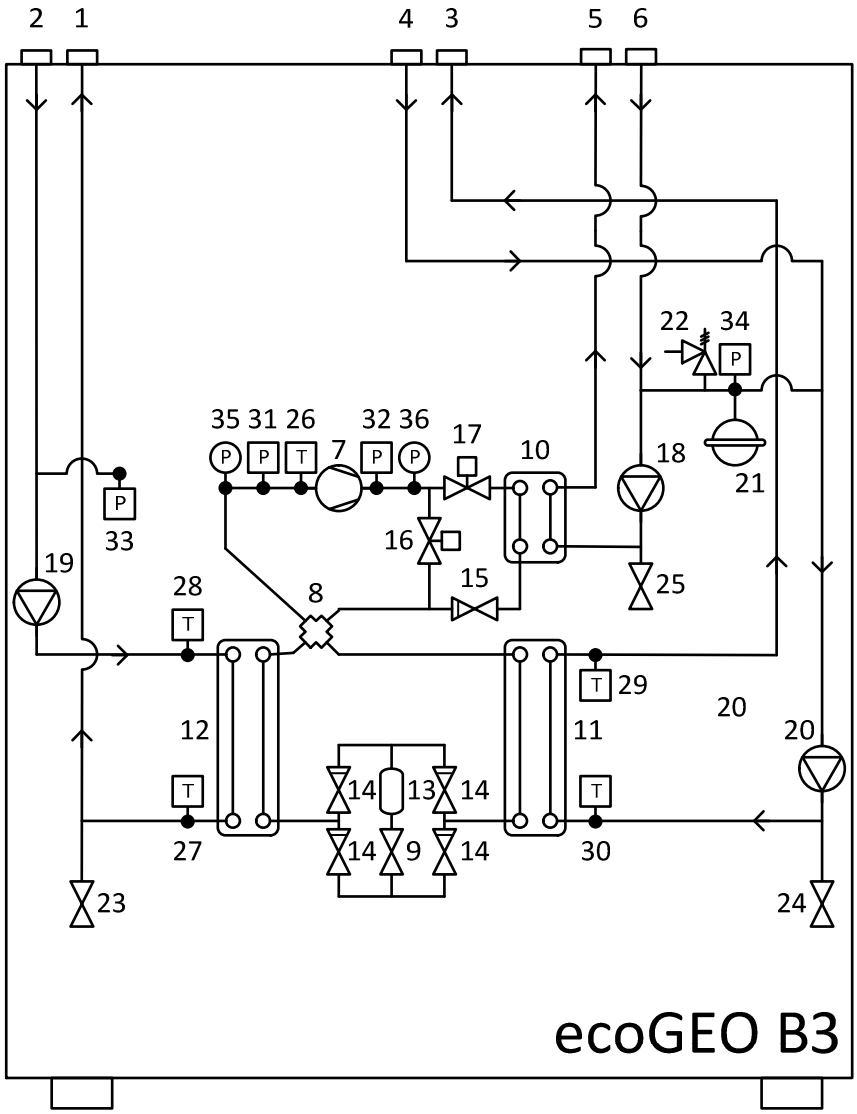


Figure 12.3. Internal schematic of ecoGEO B3 heat pumps.

No	Description	No	Description
1	Brine outlet (G1´´H)	19	Brine circulation pump
2	Brine inlet (G1´´H)	20	Heating-cooling circulation pump
3	Heating-cooling outlet (G1´´H)	21	Heating-cooling expansion vessel
4	Heating-cooling (G1´´H)	22	Heating-cooling security valve
5	DHW circuit outlet (G3/4´´H)	23	Brine drain valve
6	DHW circuit inlet (G3/4´´H)	24	Heating-cooling drain valve
7	Inverter compressor	25	DHW circuit's drain valve
8	4-way reversing valve	26	Compressor suction temperature probe
9	Electronic expansion valve	27	Brine outlet temperature probe
10	DHW desuperheater heat exchanger	28	Brine inlet temperature probe
11	Condenser / Evaporator	29	Heating-cooling outlet temperature probe
12	Evaporator / Condenser	30	Heating-cooling inlet temperature probe
13	Combi filter dryer	31	Compressor suction pressure transducer
14	Check valves for reverse cycling	32	Compressor discharge pressure transducer
15	DHW desuperheater check valve	33	Brine pressure transducer
16	Solenoid valve for only heating-cooling	34	Heating-cooling pressure transducer
17	Solenoid valve for DHW production	35	Low pressure switch
18	DHW circulation pump	36	High pressure switch

Table 12.4. Legend of components in the internal schematic of ecoGEO B3 heat pumps.

12.3. ELECTRICAL PANEL CONECTIONS

Figure 12.4 shows the upper terminal block of the electrical panel of ecoGEO B1 and ecoGEO B2 heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

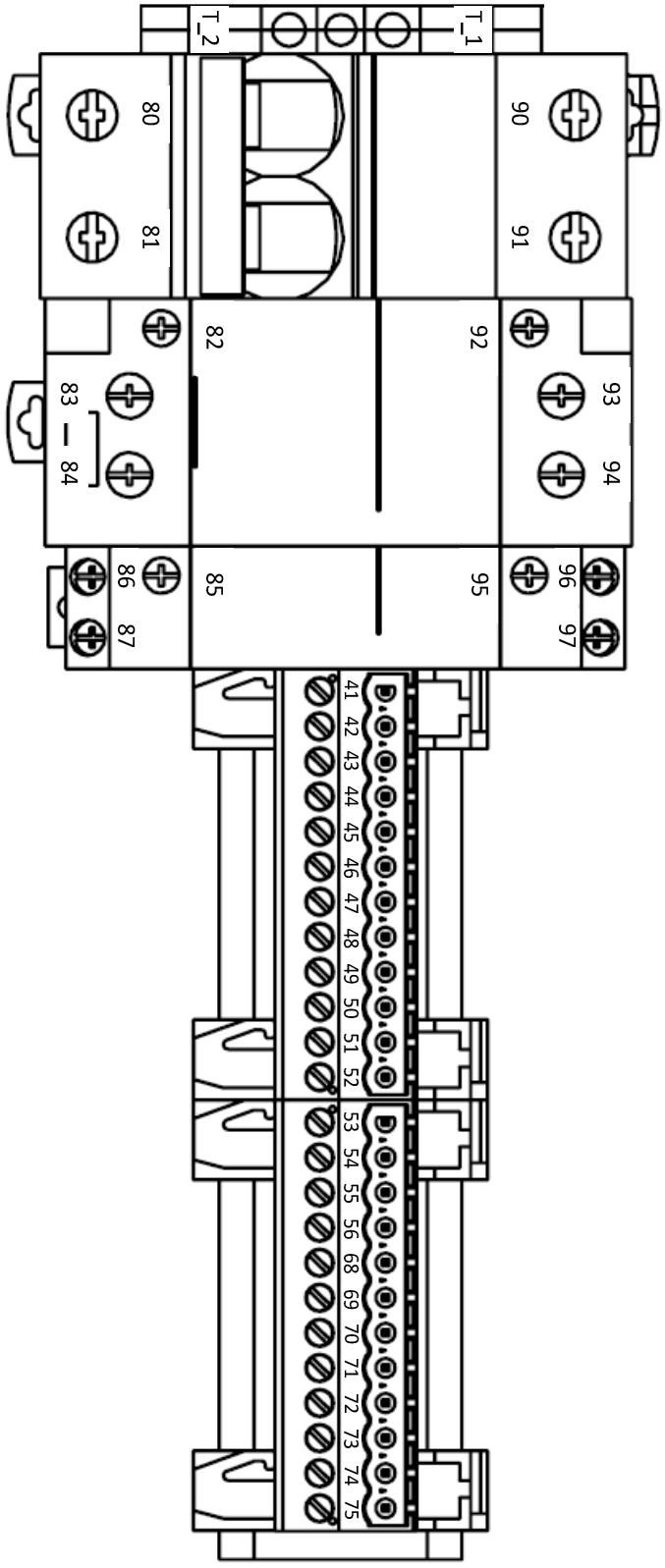


Figure 12.4. Upper terminal block of ecoGEO B1 ecoGEO B2 heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

Figure 12.5 shows the upper terminal block of the electrical panel of ecoGEO B3 heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

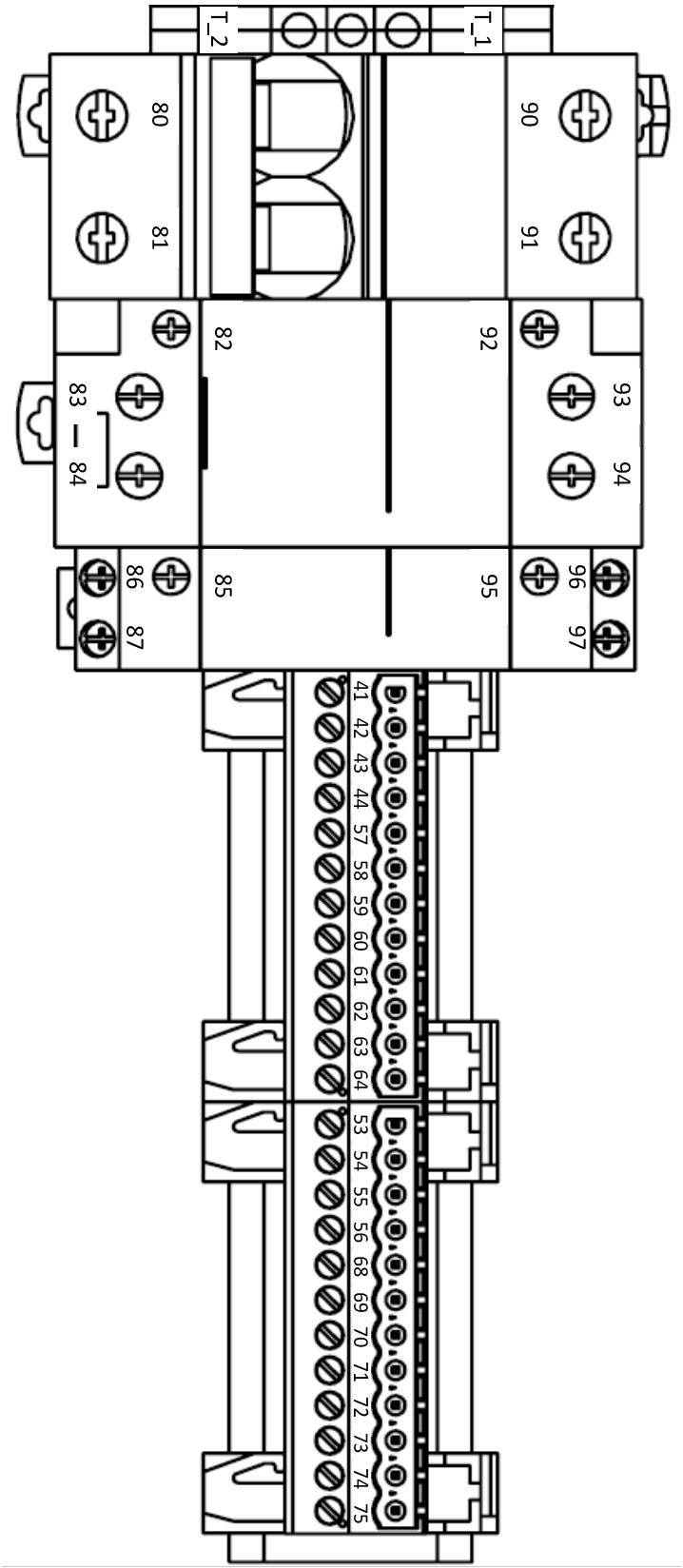


Figure 12.5. Upper terminal block of ecoGEO B3 heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

Figure 12.6 shows the upper terminal block of the electrical panel of ecoGEO B1 and ecoGEO B2 heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

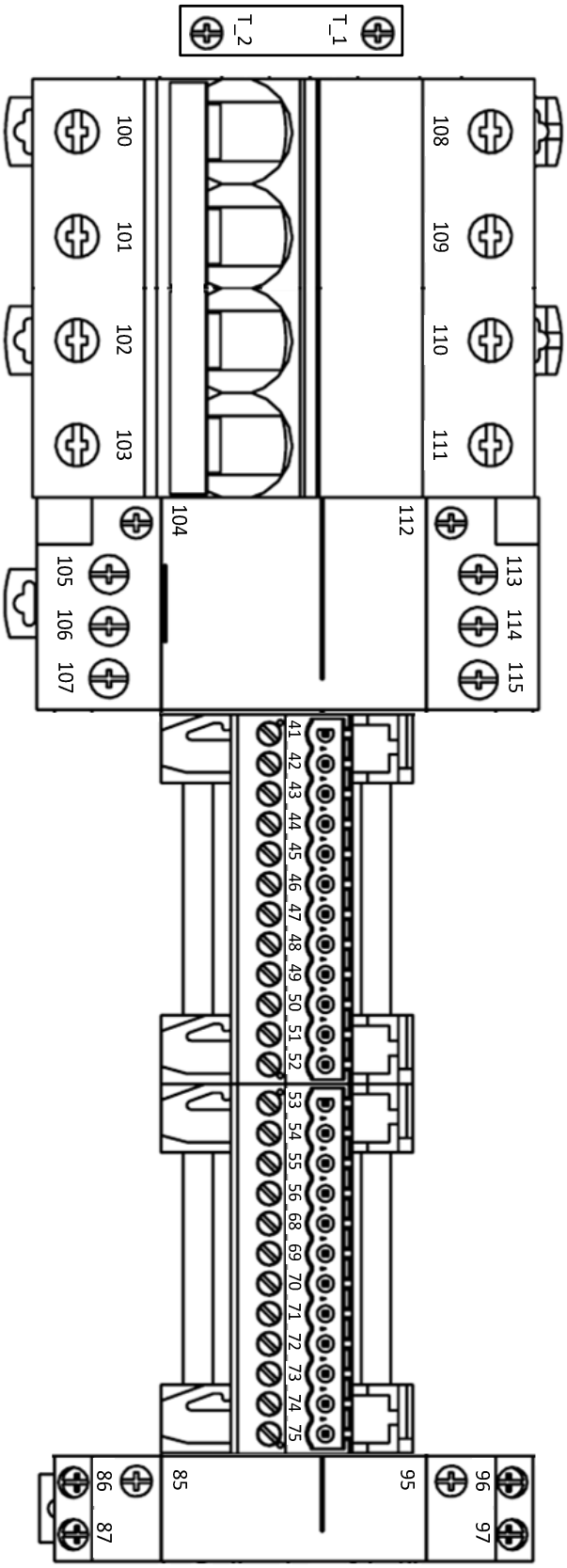


Figure 12.6. Upper terminal block of ecoGEO B1 and ecoGEO B2 heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

Figure 12.7 shows the upper terminal block of the electrical panel of ecoGEO B3 heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

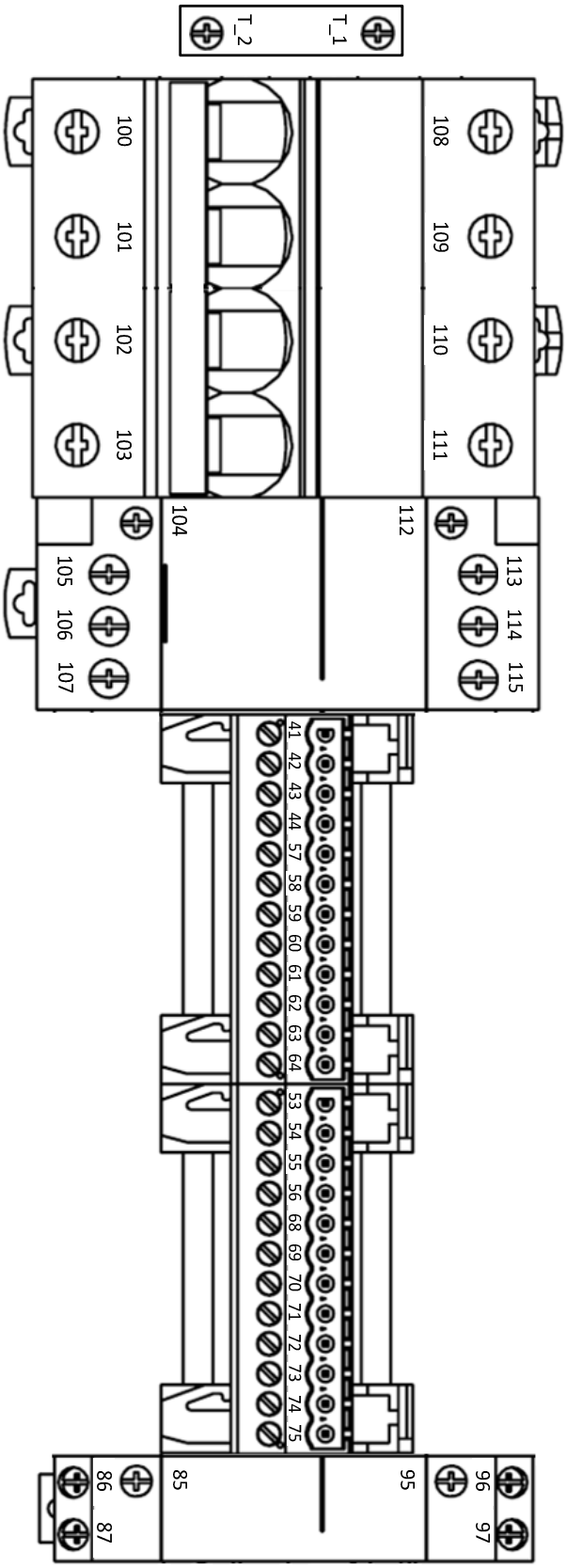


Figure 12.7. Upper terminal block of ecoGEO B3 heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

Table 12.5 shows the legend with the upper terminal block wiring of ecoGEO B1, ecoGEO B2 and ecoGEO B3 heat pumps' electrical panel.

Terminal No.	Component	
T_1	Ground	Single-phase power supply (230 V / 50 Hz, 1/N/PE~)
90	Phase	
91	Neutral	
T_1	Ground	Three-phase power supply (400 V / 50 Hz, 3/N/PE~)
108	Phase L1	
109	Phase L2	
110	Phase L3	
111	Neutral	
93	Phase	Single-phase inverter/compressor
94	Neutral	
113	Phase	Three-phase inverter/compressor
114	Phase	
115	Phase	
96	Phase	Legionella protection electric heater. Maximum consumption 16 A 230 Vac
97	Neutral	
41	Phase	Low pressure switch
42	Neutral	
43	Phase	High pressure switch
44	Neutral	
45	Phase	3-way valve for heating/DHW mode (only ecoGEO B1 and B2)
46	Phase	
47	Neutral	
48	Ground	
49	Phase	3-way valves for free cooling (only ecoGEO B2)
50	Phase	
51	Neutral	
52	Ground	
53	Phase	3-way valve for pool Maximum consumption 1 A 230 Vac
54	Phase	
55	Neutral	
56	Ground	
57	Phase	4-way reversing valve (only ecoGEO B3)
58	Neutral	
59	Phase	Solenoid valve for heating-cooling (VS1) (only ecoGEO B3) Production of heating or cooling only
60	Neutral	
61	Ground	
62	Phase	DHW circulation pump (BACS) + DHW solenoid valve (VS2) (only ecoGEO B3) Production of DHW and heating or cooling simultaneously
63	Neutral	
64	Ground	
68	Phase	Brine circulation pump
69	Neutral	
70	Ground	
71	Phase	Heating-cooling circulation pump
72	Neutral	
73	Ground	
74	Phase	Alarm signal. Maximum consumption 1 A 230 Vac
75	Neutral	

Table 12.5. Shows the legend with the upper terminal block connections of ecoGEO B1, ecoGEO B2 and ecoGEO B3 heat pumps' panel board.

Figure 12.8 shows the panel board's terminal block at the bottom of ecoGEO B1 and ecoGEO B2 and ecoGEO B3.heat pumps.

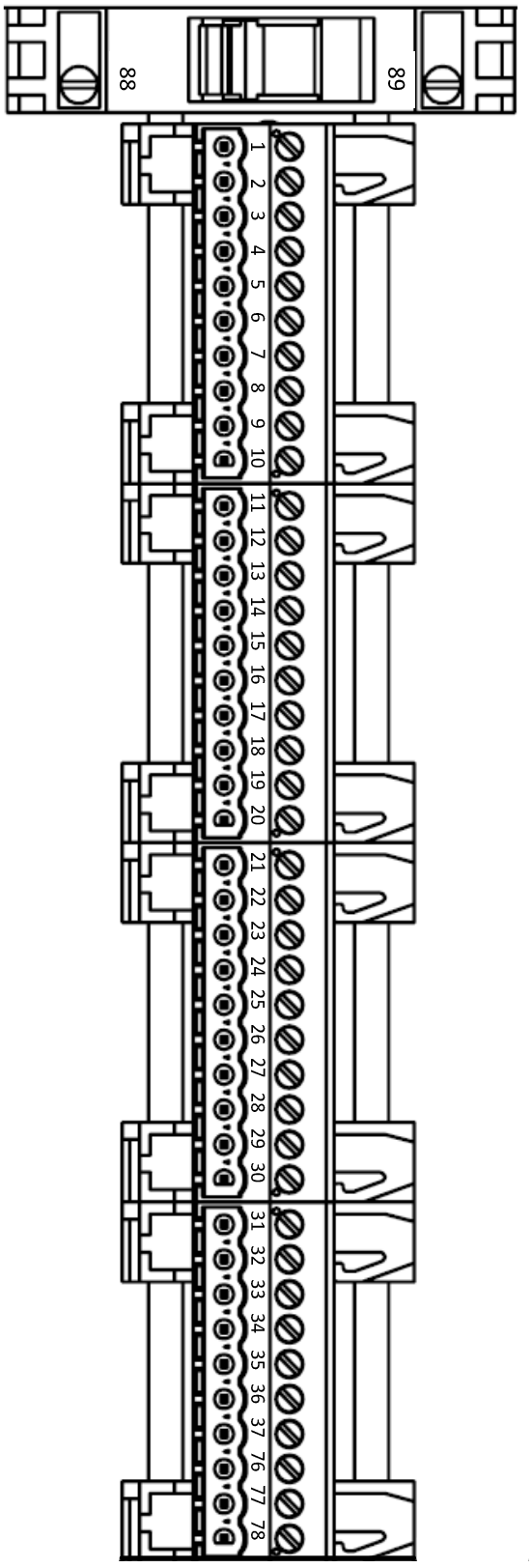


Figure 12.8. Lower terminal block of ecoGEO B1, ecoGEO B2 and ecoGEO B3 heat pumps.

Table 12.6 shows the legend with the bottom terminal block wiring of ecoGEO B1, ecoGEO B2 and ecoGEO B3 heat pumps' panel board.

LEGEND WITH THE BOTTOM TERMINAL BLOCK WIRING OF THE PANEL BOARD		
Terminal No.	**Component**	
1	Signal	Analog input NTC Brine outlet temperature probe
2	Ground	
3	Signal	Analog input NTC Brine inlet temperature probe
4	Ground	
5	Signal	Analog input NTC Heating-cooling outlet temperature probe
6	Ground	
7	Signal	Analog input NTC Heating-cooling temperature probe
8	Ground	
9	Signal	Analog input NTC Compressor suction temperature probe
10	Ground	
11	Signal	Radiometric Analog input 0-5 Vdc Compressor suction pressure transducer
12	Ground	
13	+ 5 Vdc ref	
14	Signal	Radiometric Analog input 0-5 Vdc Compressor discharge pressure transducer
15	Ground	
16	+ 5 Vdc ref	
17	Signal	Analog input NTC DHW tank temperature probe
18	Ground	
19	Signal	Analog input NTC Buffer tank temp. probe / Heating-cooling outlet temp. Probe, Zone2
20	Ground	
21	Signal	Analog input NTC Outdoor temperature probe
22	Ground	
23	Signal	Radiometric Analog input 0-5 Vdc Brine pressure transducer
24	Ground	
25	+ 5 Vdc ref	
26	Signal	Radiometric Analog input 0-5 Vdc Heating-cooling pressure transducer
27	Ground	
28	+ 5 Vdc ref	
29	Signal	Analog output 0-10 Vdc Brine circulation pump control
30	Ground	
31	Signal	Analog output 0-10 Vdc Heating-cooling circulation pump control
32	Ground	
33	Signal	Analog output 0-10 Vdc External shunt group control for Zone 2 (3-way modulating valve)
34	Ground	
35	Phase	Activation of external shunt group for Zone 2 Maximum consumption 1 A 230 Vac
36	Neutral	
37	Ground	
76	Phase	Activation of 2-way valve for Zone 1. Maximum consumption 1 A 230 Vac
77	Neutral	
78	Ground	

Table 12.6. shows the legend with the lower terminal block connections of ecoGEO B1, ecoGEO B2 and ecoGEO B3 heat pumps' panel board.

12.4. ECOGEO B1 AND ECOGEO B2 WIRING DIAGRAMS

Figure 12.9 shows the power wiring diagrams of ecoGEO B1 and ecoGEO B2 heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

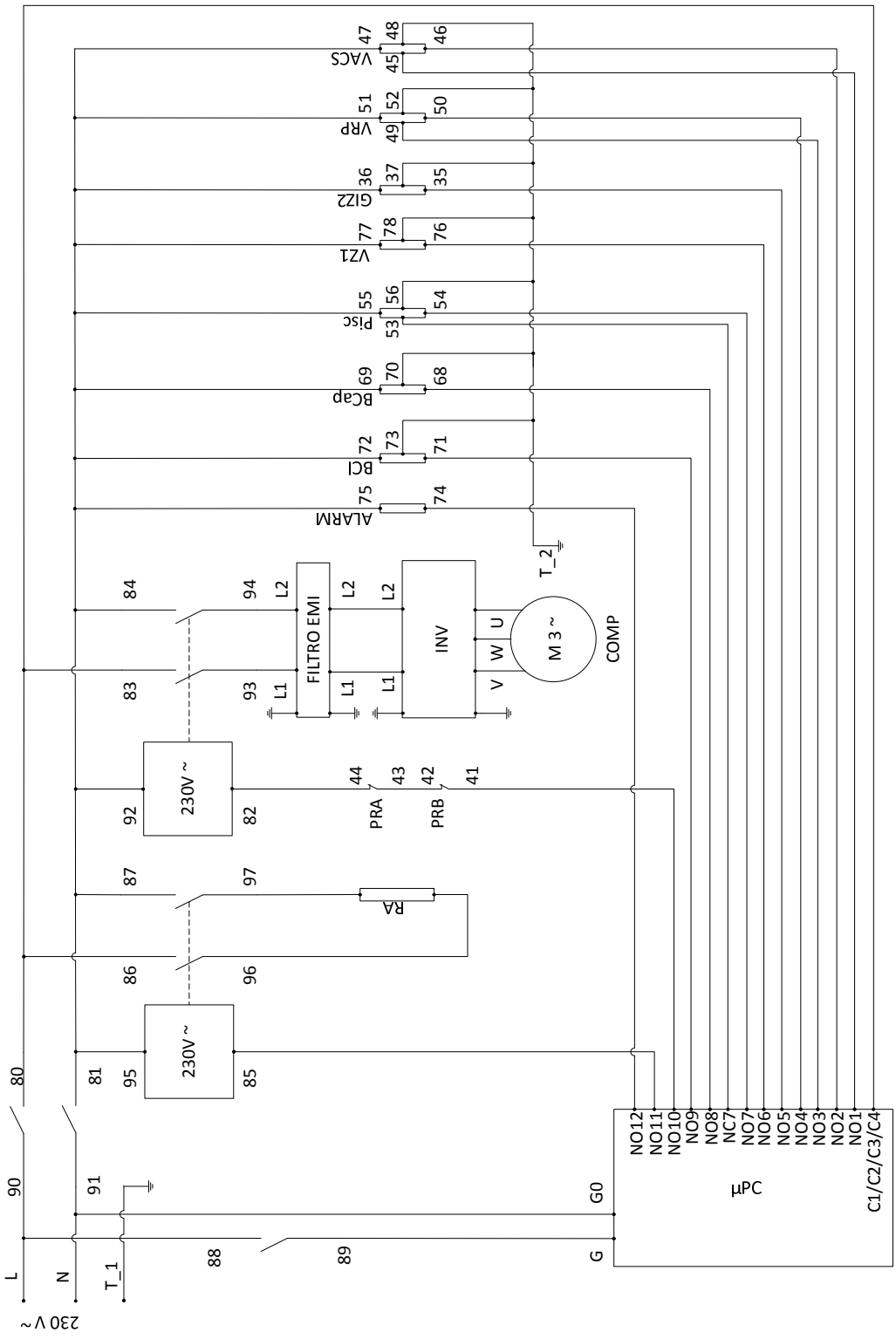


Figure 12.9. Power wiring diagrams of ecoGEO B1 and ecoGEO B2 heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

Figure 12.10 shows the power wiring diagrams of ecoGEO B1 and ecoGEO B2 heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

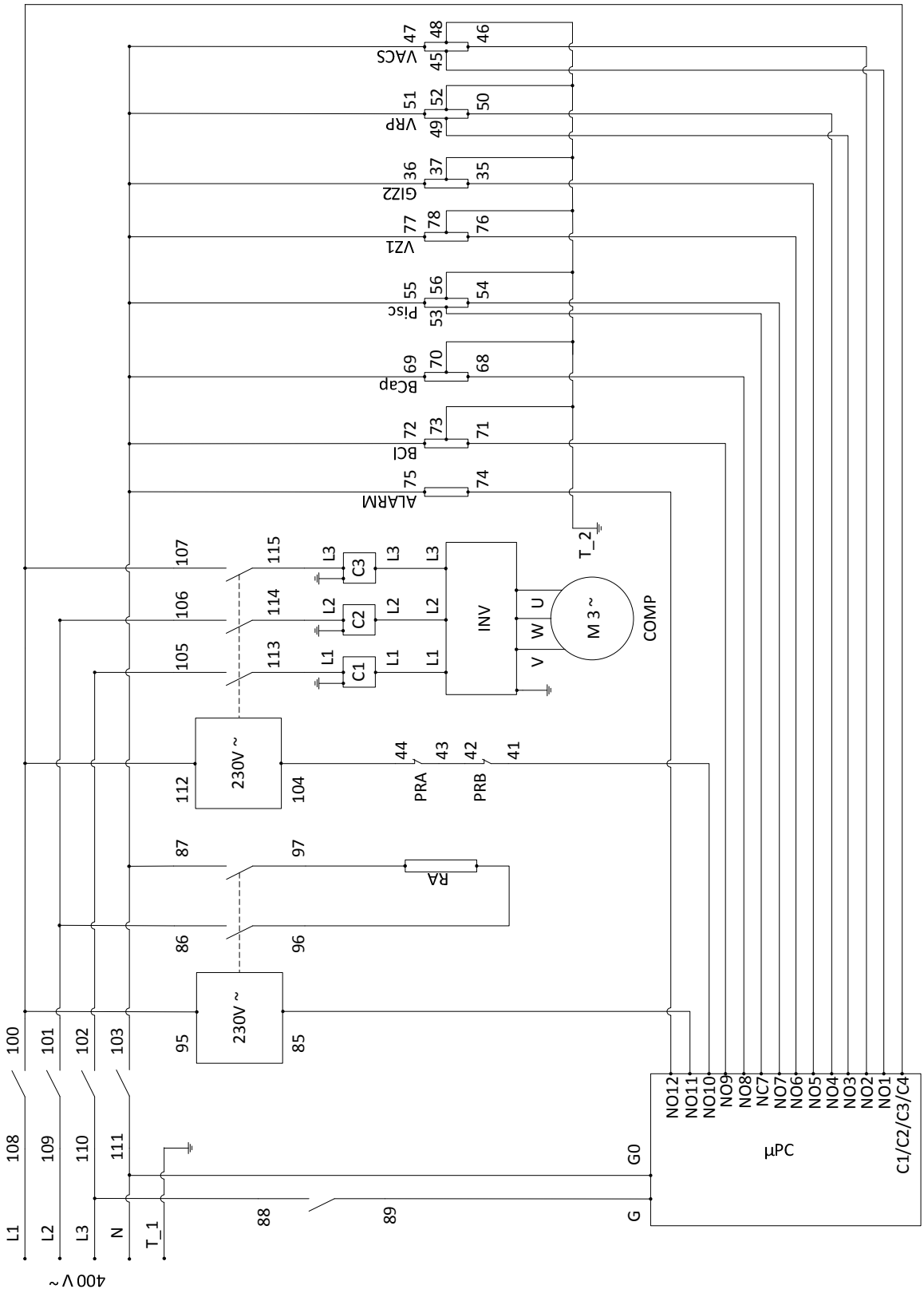


Figure 12.10. Power wiring diagrams of ecoGEO B1 and ecoGEO B2 heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

Figure 12.11 shows the connection diagram of ecoGEO B1 and ecoGEO B2 heat pumps' micro-controller.

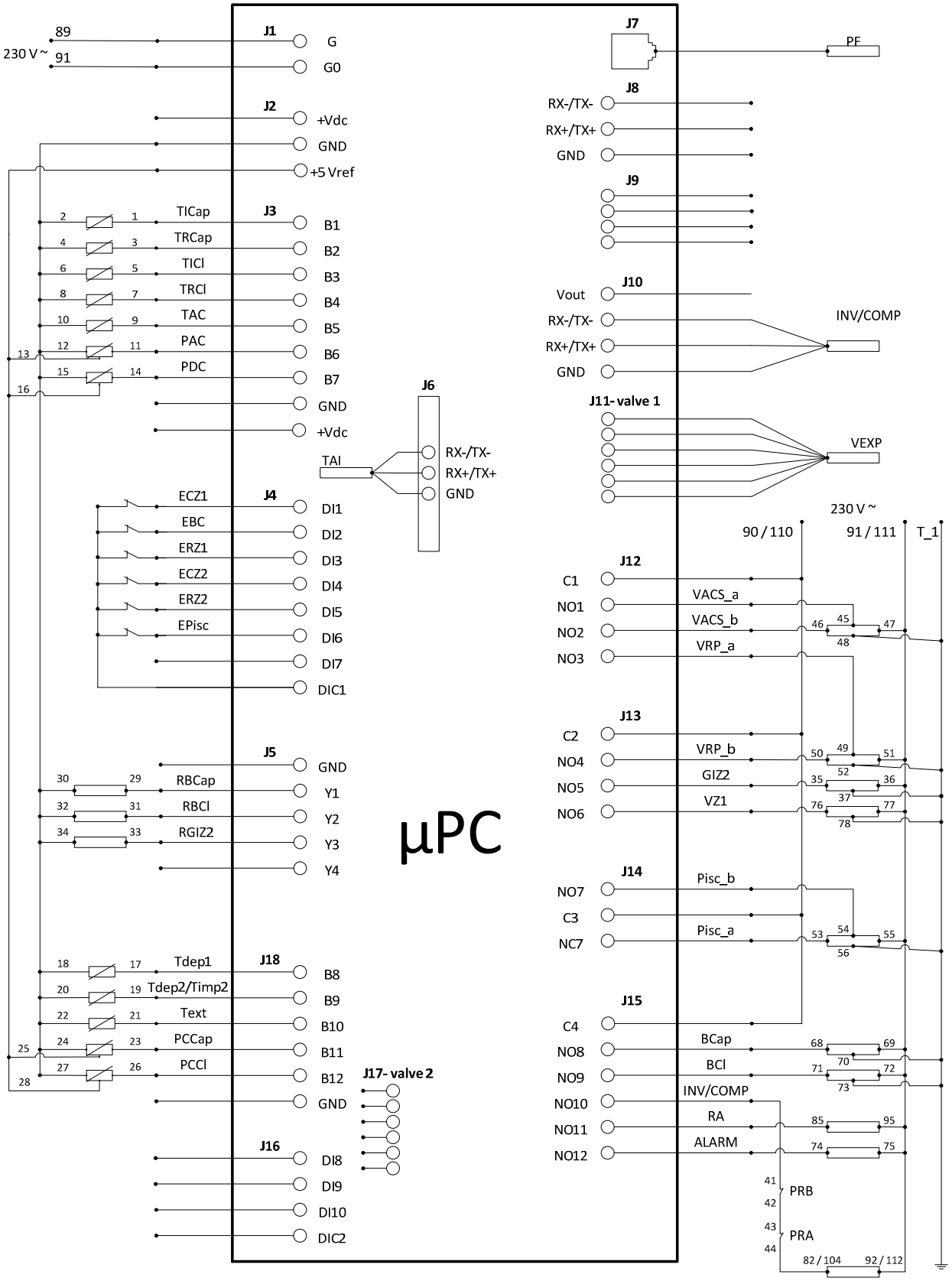


Figure 12.11. Connection diagram of ecoGEO B1and ecoGEO B2 heat pumps' micro-controller.

Figure 12.12 shows the installation diagram of ecoGEO B1 and ecoGEO B2 heat pumps.

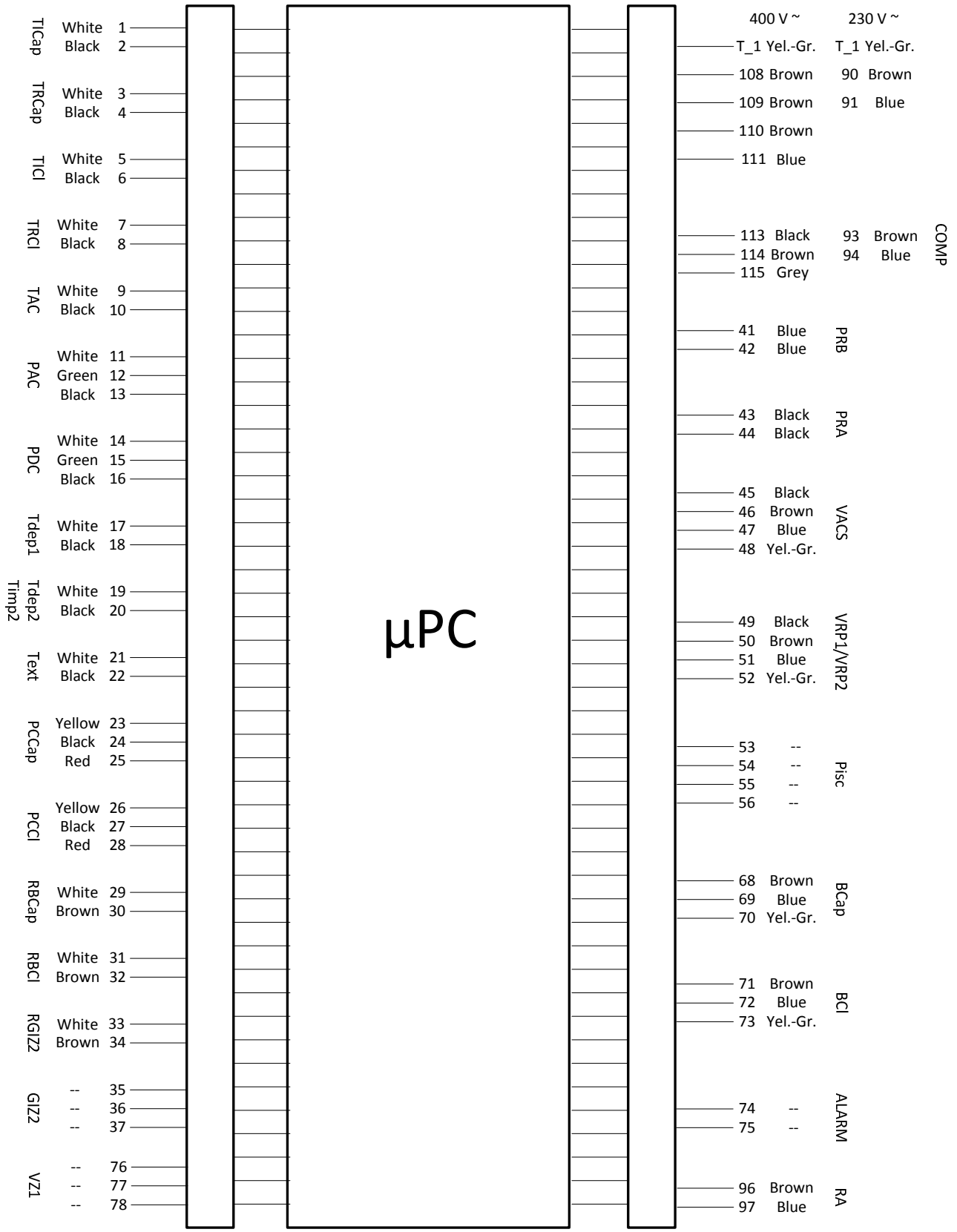


Figure 12.12. Installation diagram of ecoGEO B1 and ecoGEO B2 heat pumps.

Connection terminal		No.	Description	Nomenclature
Power supply Connector J1		G	Micro-controller power supply (Phase)	L
		G0	Micro-controller power supply (Neutral)	N
Probe power supply Connector J2		GND	Ground for analogue and digital inputs/outputs	--
		+5 Vref	Power supply for active probes, +5 Vdc	--
Analogue inputs – group 1 Connector J3		B1	Brine outlet temperature probe	TICap
		B2	Brine inlet temperature probe	TRCap
		B3	Heating-cooling outlet temperature probe	TICl
		B4	Heating-cooling inlet temperature probe	TRCl
		B5	Compressor suction temperature probe	TAC
		B6	Compressor suction pressure transducer	PAC
		B7	Compressor discharge pressure transducer	PDC
Analogue inputs – group 2 Connector J18		B8	DHW tank temperature probe	Tdep1
		B9	Buffer tank temperature probe or Heating-cooling outlet temperature in Zone 2	Tdep2/ Timp2
		B10	Outdoor temperature	Text
		B11	Brine circuit pressure transducer	PCCap
		B12	Heating-cooling circuit pressure transducer	PCCl
Digital inputs – group 1 Connector J4		DI1	Relay thermostat input for heating, Zone1	ECZ1
		DI2	Heat pump external activation input	EBC
		DI3	Relay thermostat input for cooling, Zone 1	ERZ1
		DI4	Relay thermostat input for heating, Zone 2	ECZ2
		DI5	Relay thermostat input for cooling, Zone 2	ERZ2
		DI6	Pool activation input	EPisc
		DIC1	Common pole for digital inputs	--
Analogue outputs (0-10 Vdc) Connector J5		Y1	Control signal for brine punmp	RBCap
		Y2	Control signal for heating-cooling pump	RBCl
		Y3	Control signal for external shunt group, Zone 2	RGIZ2
Relay digital outputs – group 1 Connector J12		NO1	3-way valve for heating/DHW (position A)	Vacs_a
		NO2	3-way valve for heating/DHW (position B)	Vacs_b
		NO3	3-way valve for free cooling (position A)	VRP_a
Relay digital outputs – group 2 Connector J13		NO4	3-way valve for free cooling (position B)	VRP_b
		NO5	External shunt group activation, Zone 2	GIZ2
		NO6	2-way valve On/Off, Zone 1	VZ1
Relay digital outputs – group 3 Connector J14		NO7	3-way valve for pool (position B)	Pisc_a
		NC7	3-way valve for pool (position A)	Pisc_b
Relay digital outputs – group 4 Connector J15		NO8	Brine circulation pump	BCap
		NO9	Heating-cooling circulation pump	BCl
		NO10	Inverter/compressor	INV/COMP
		NO11	Legionella protection electric heater	RA
		NO12	Alarm signal	ALARM
Pressure switches		Low pressure switch		PRB
		High pressure switch		PRA
Data ports	Connector J6	th-Tune indoor terminals (RS485)		TAI
	Connector J7	Front panel connector/Application update		PF
	Connector J10	Inverter/compressor (RS485)		INV/COMP
	Connector J11	Electronic expansion valve		VEXP

Table 12.7. Legend of ecoGEO B1 and ecoGEO B2 heat pumps' wiring diagrams.

12.5. ECOGEO B3 WIRING DIAGRAMS

Figure 12.13 shows the power wiring diagrams of ecoGEO B3 heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

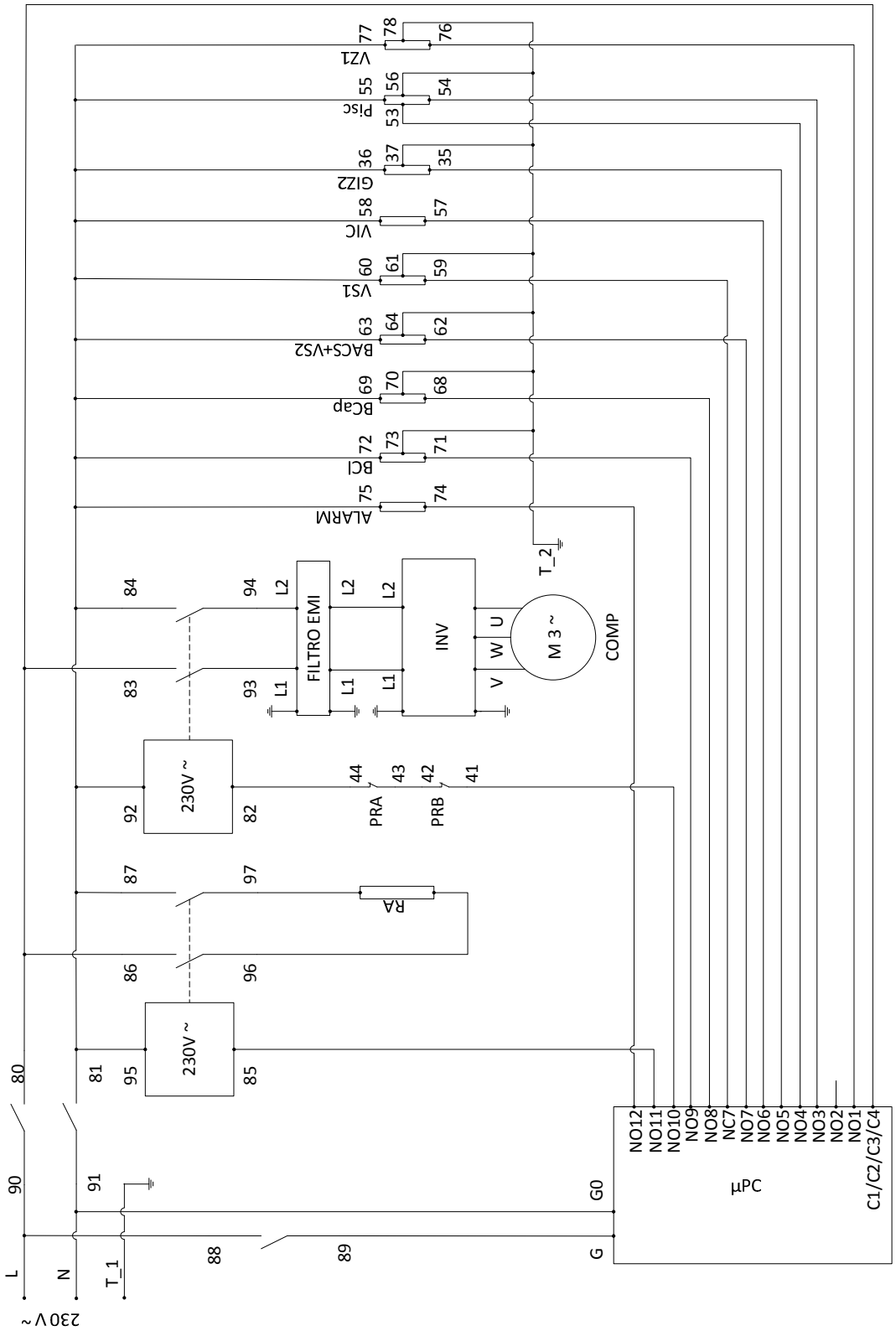


Figure 12.13. Power wiring diagram of ecoGEO B3 heating pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~).

Figure 12.13 shows the power wiring diagrams of ecoGEO B3 heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

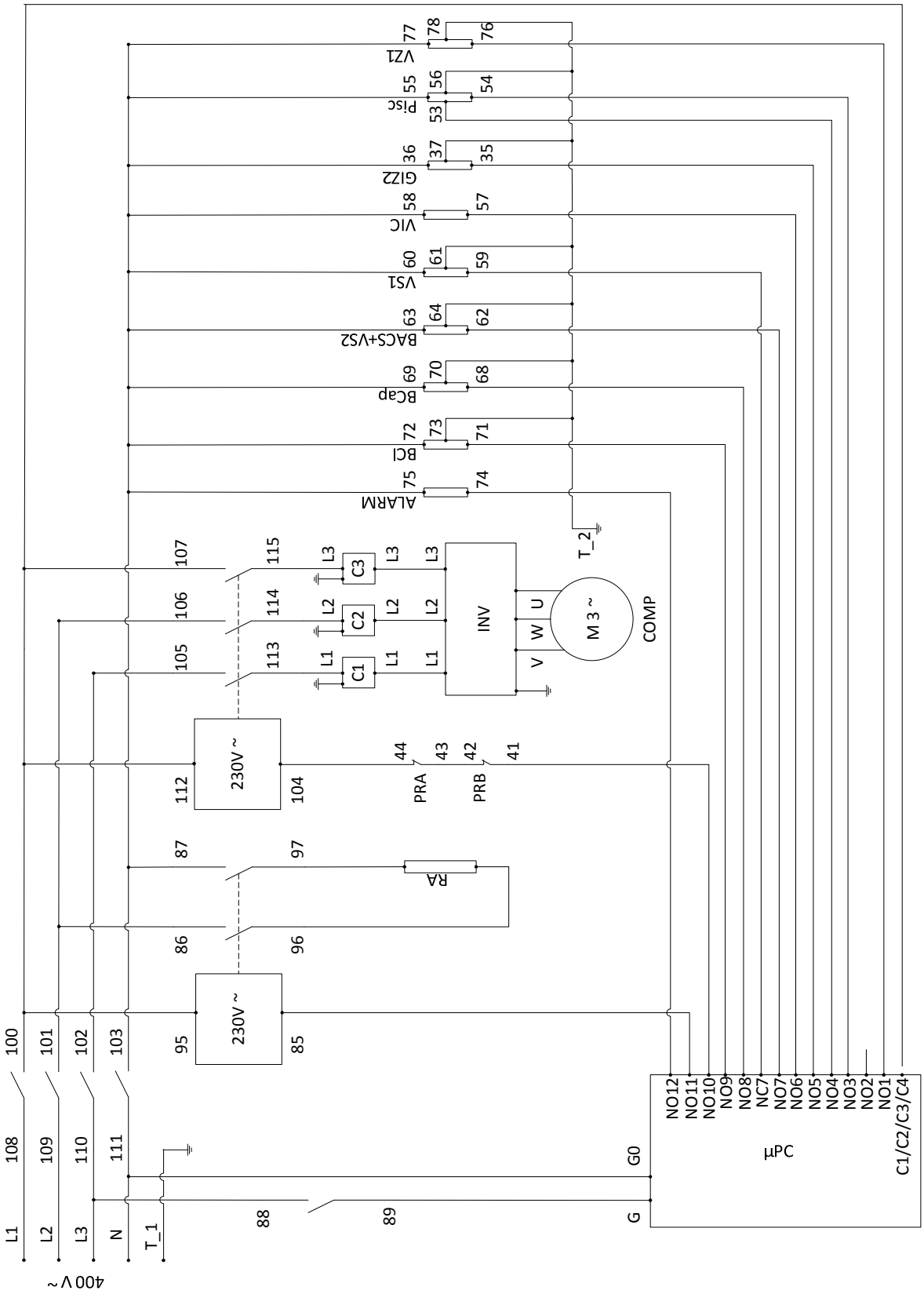


Figure 12.14. Power wiring diagram of ecoGEO B3 heating pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~).

Figure 12.15 shows the connection diagram of ecoGEO B3 heat pumps' micro-controller.

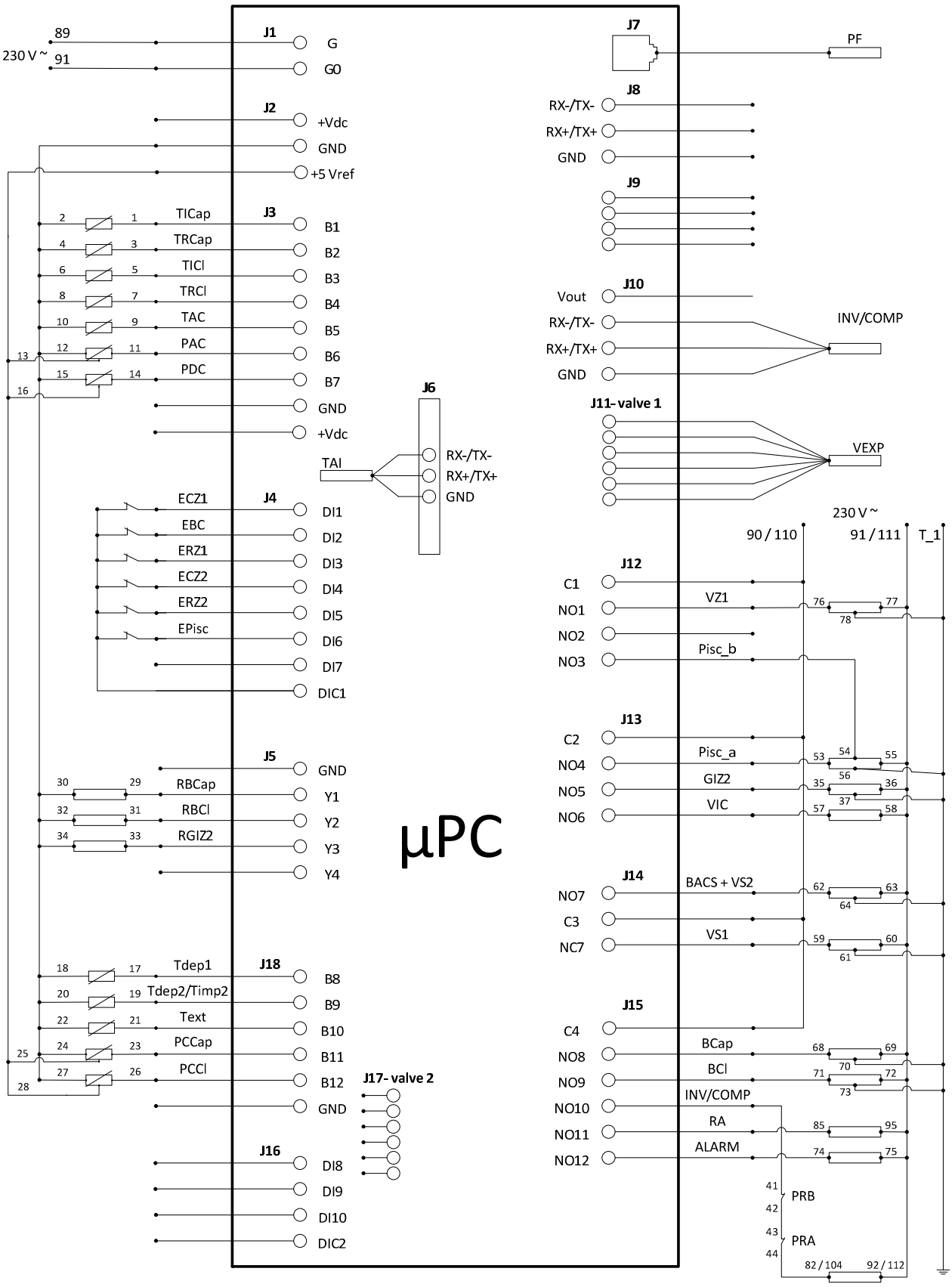


Figure 12.15. Connection diagram of ecoGEO B3 heat pumps' micro-controller

Figure 12.16 shows the installation diagram of ecoGEO B3 heat pumps.

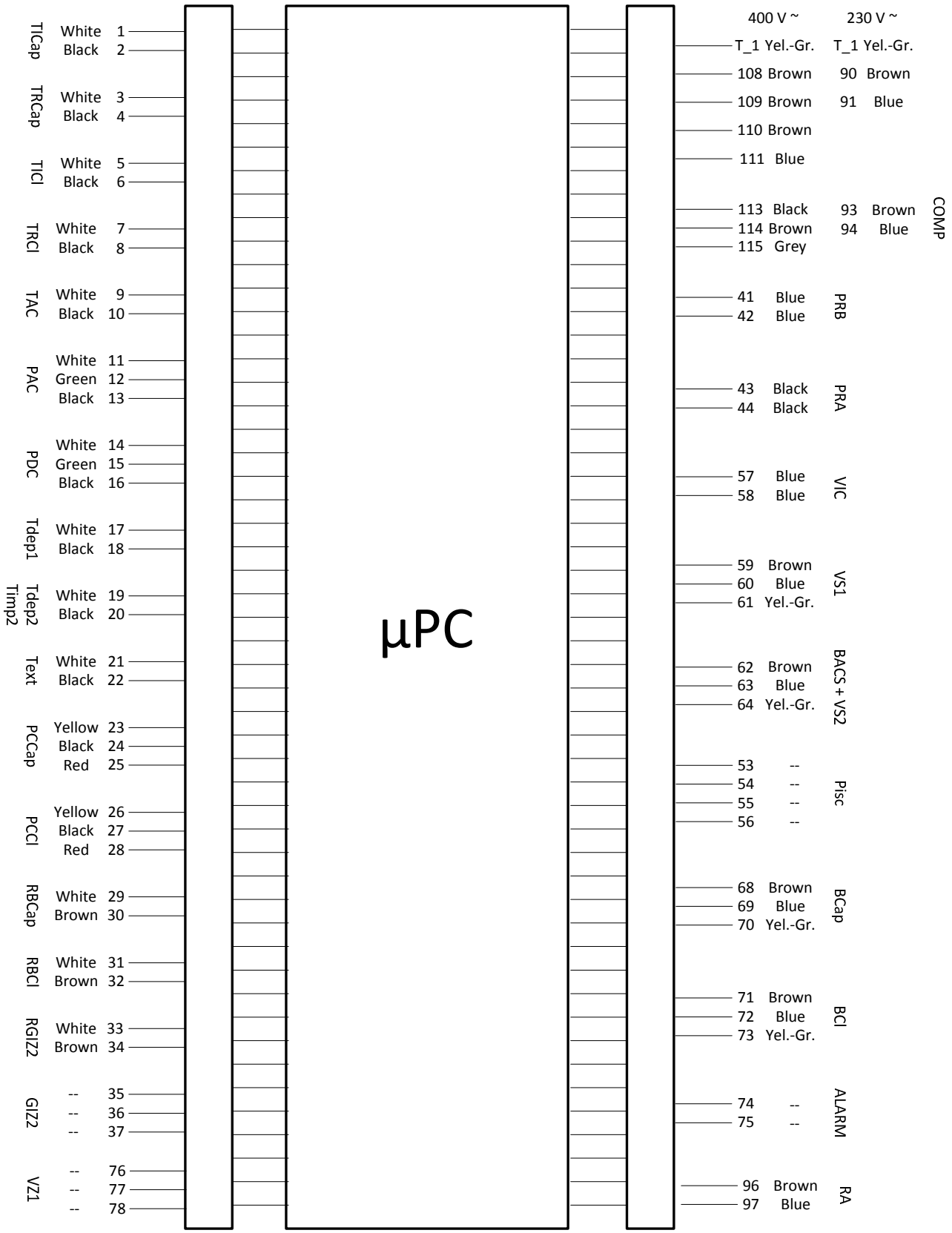


Figure 12.16. Installation diagram of ecoGEO B3 heat pumps.

Connection terminal		No.	Description	Nomenclature
Power supply Connector J1		G	Micro-controller power supply (Phase)	L
		G0	Micro-controller power supply (Neutral)	N
Probe power supply Connector J2		GND	Ground for analogue and digital inputs/outputs	--
		+5 Vref	Power supply for active probes, +5 Vdc	--
Analogue inputs – group 1 Connector J3		B1	Brine outlet temperature probe	TICap
		B2	Brine inlet temperature probe	TRCap
		B3	Heating-cooling outlet temperature probe	TICl
		B4	Heating-cooling inlet temperature probe	TRCl
		B5	Compressor suction temperature probe	TAC
		B6	Compressor suction pressure transducer	PAC
		B7	Compressor discharge pressure transducer	PDC
Analogue inputs – group 2 Connector J18		B8	DHW tank temperature probe	Tdep1
		B9	Buffer tank temperature probe or Heating-cooling outlet temperature, Zone 2	Tdep2/ Timp2
		B10	Outdoor temperature	Text
		B11	Brine circuit pressure transducer	PCCap
		B12	Heating-cooling circuit pressure transducer	PCCl
Digital inputs – group 1 Connector J4		DI1	Relay thermostat input for heating, Zone1	ECZ1
		DI2	Heat pump external activation input	EBC
		DI3	Relay thermostat input for cooling, Zone 1	ERZ1
		DI4	Relay thermostat input for heating, Zone 2	ECZ2
		DI5	Relay thermostat input for cooling, Zone 2	ERZ2
		DI6	Pool activation input	EPisc
		DIC1	Common pole for digital inputs	--
Analogue outputs (0-10 Vdc) Connector J5		Y1	Control signal for brine punmp	RBCap
		Y2	Control signal for heating-cooling pump	RBCl
		Y3	Control signal for external shunt group, Zone 2	RGIZ2
Relay digital outputs – group 1 Connector J12		NO1	2-way valve On/Off, Zone 1	VZ1
		NO3	3-way valve for pool (position B)	Pisc_b
Relay digital outputs – group 2 Connector J13		NO4	3-way valve for pool (position A)	Pisc_a
		NO5	External shunt group activation, Zone 2	GIZ2
		NO6	4-way reversing cycle valve	VIC
Relay digital outputs – group 3 Connector J14		NO7	Solenoid valve for DHW production	BACS –VS2
		NC7	Solenoid valve for heating-cooling only	VS1
Relay digital outputs – group 4 Connector J15		NO8	Brine circulation pump	BCap
		NO9	Heating-cooling circulation pump	BCl
		NO10	Inverter/compressor	INV/COMP
		NO11	Legionella protection electric heater	RA
		NO12	Alarm signal	ALARM
Pressure switches		Low pressure switch		PRB
		High pressure switch		PRA
Data ports	Connector J6	th-Tune indoor terminals (RS485)		TAI
	Connector J7	Front panel connector/Application update		PF
	Connector J10	Inverter/compressor (RS485)		INV/COMP
	Connector J11	Electronic expansion valve		VEXP

Table 12.8. Legend of ecoGEO B3 heat pumps' wiring diagrams.

12.6. LIMITATION ON THE HEAT PUMP THERMAL POWER

Figure 12.17 shows the thermal power provided by ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35ºC.

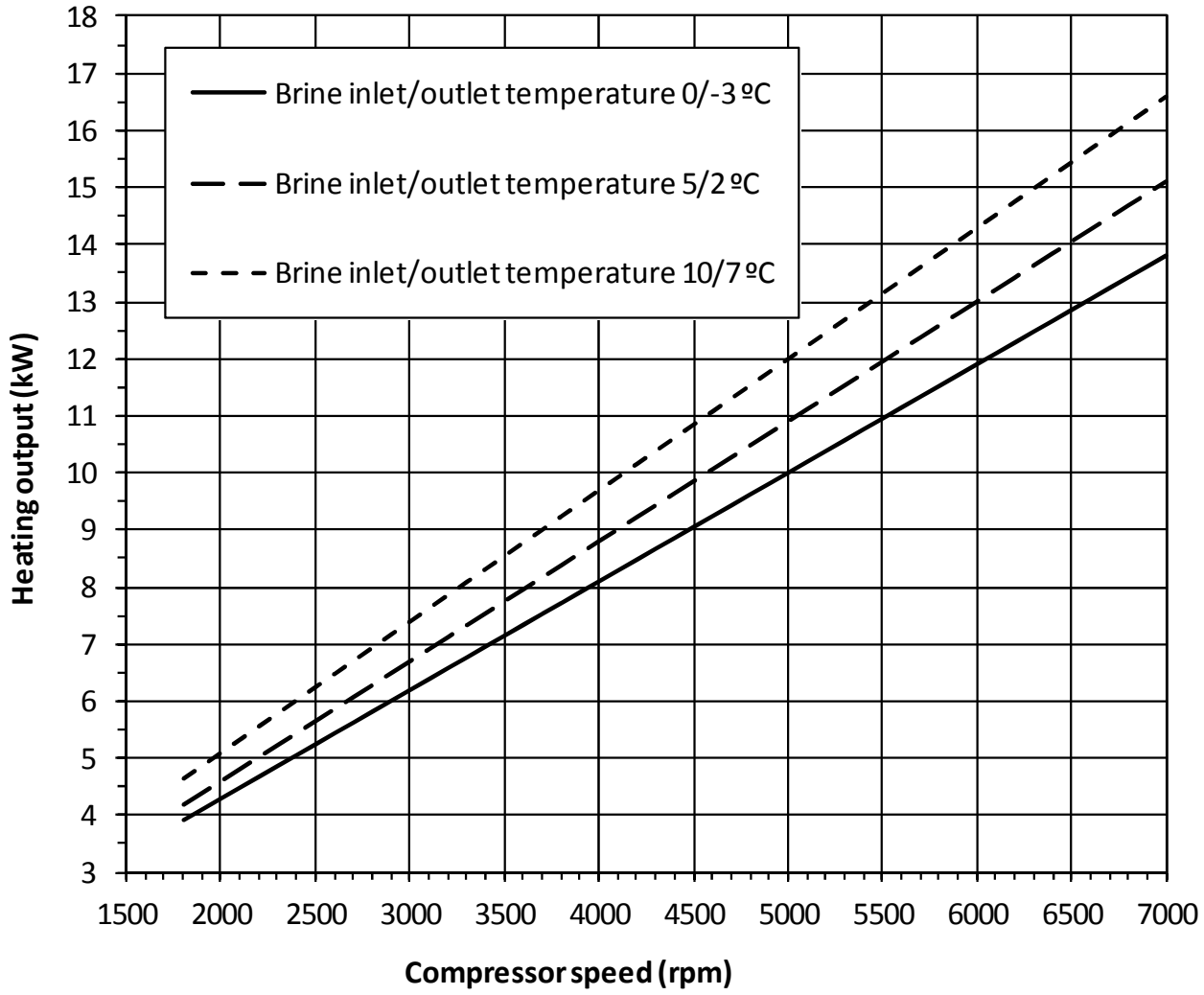


Figure 12.17. Thermal power provided by ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35ºC.

Figure 12.18 shows the thermal power provided by ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45ºC.

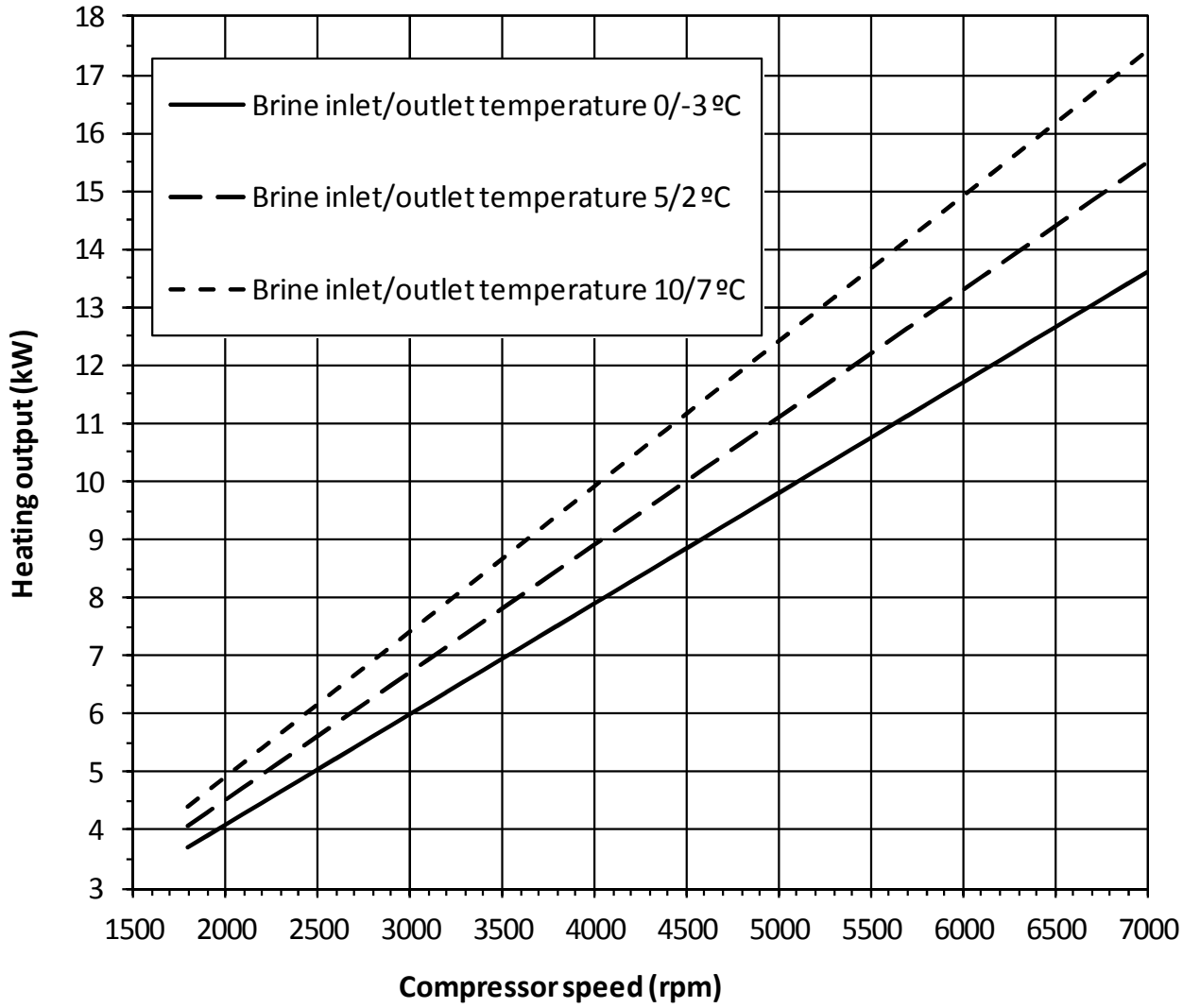


Figure 12.18. Thermal power provided by ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps as a function of on the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45ºC.

Figure 12.19 shows the thermal power provided by ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35ºC.

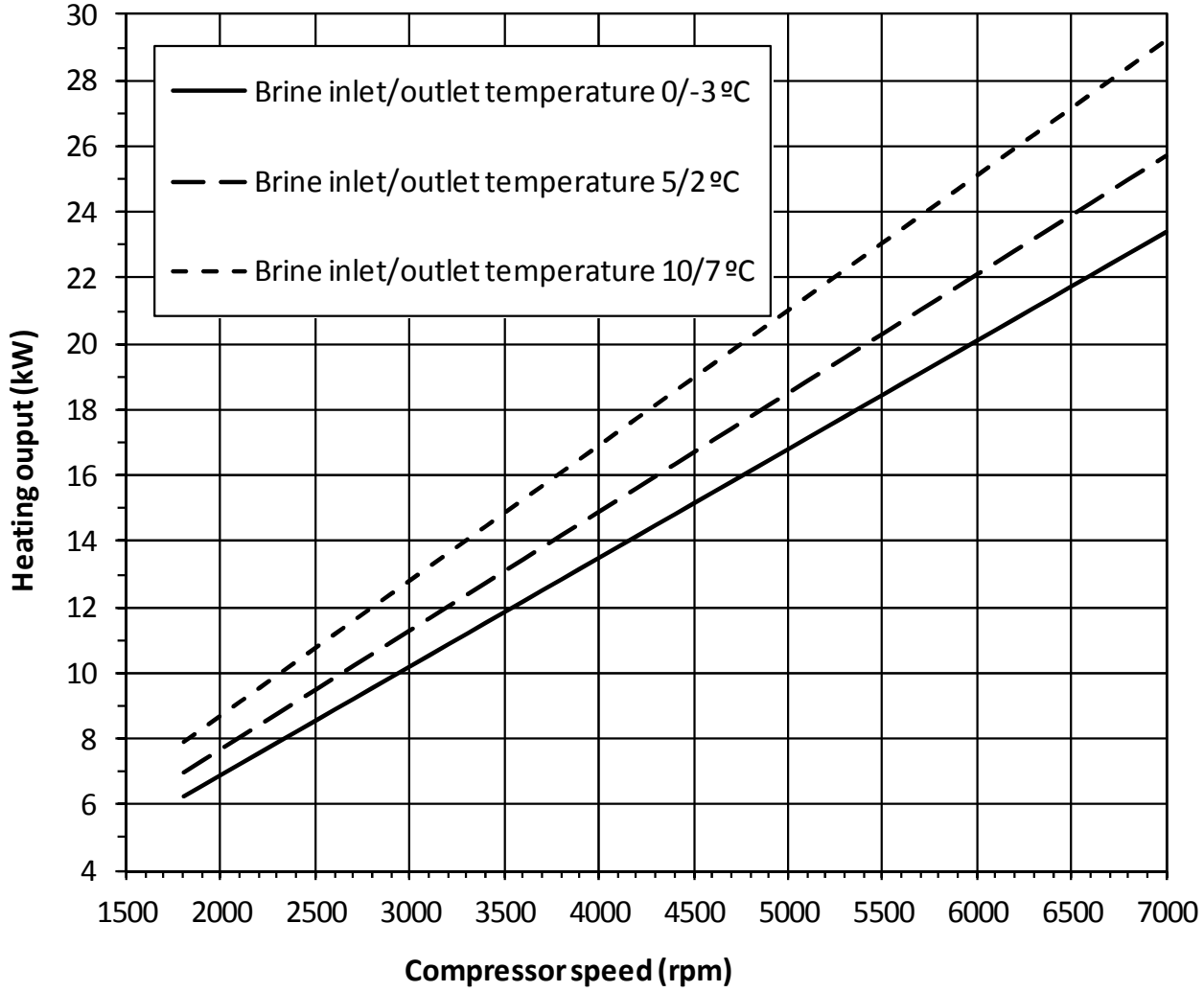


Figure 12.19. Thermal power provided by ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35ºC.

Figure 12.20 shows the thermal power provided by ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45 ºC.

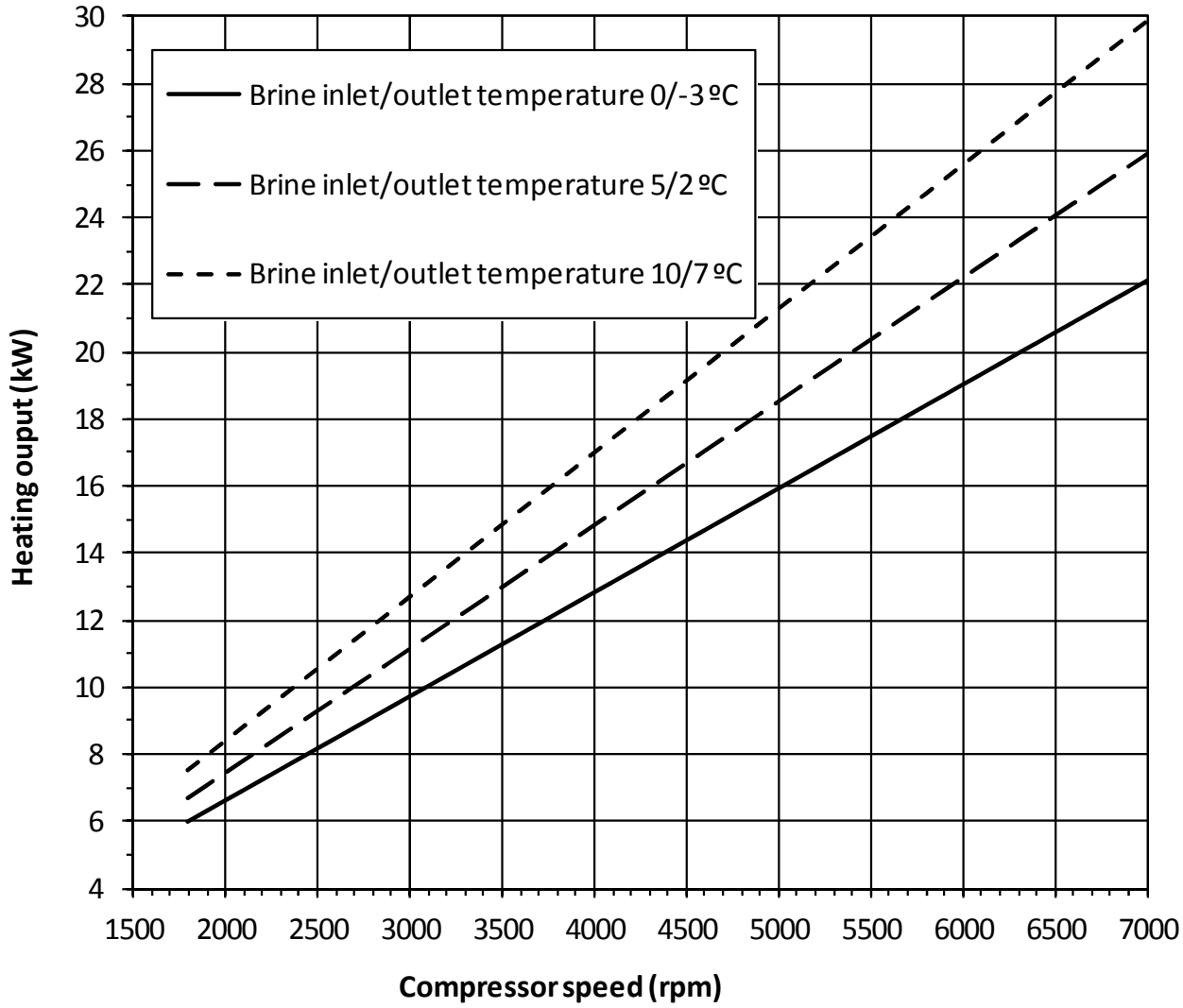


Figure 12.20. Thermal power provided by ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45 ºC.

12.7. LIMITATION OF THE HEAT PUMP ELECTRIC CONSUMPTION

Figure 12.21 shows the power consumption of ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35 ºC.

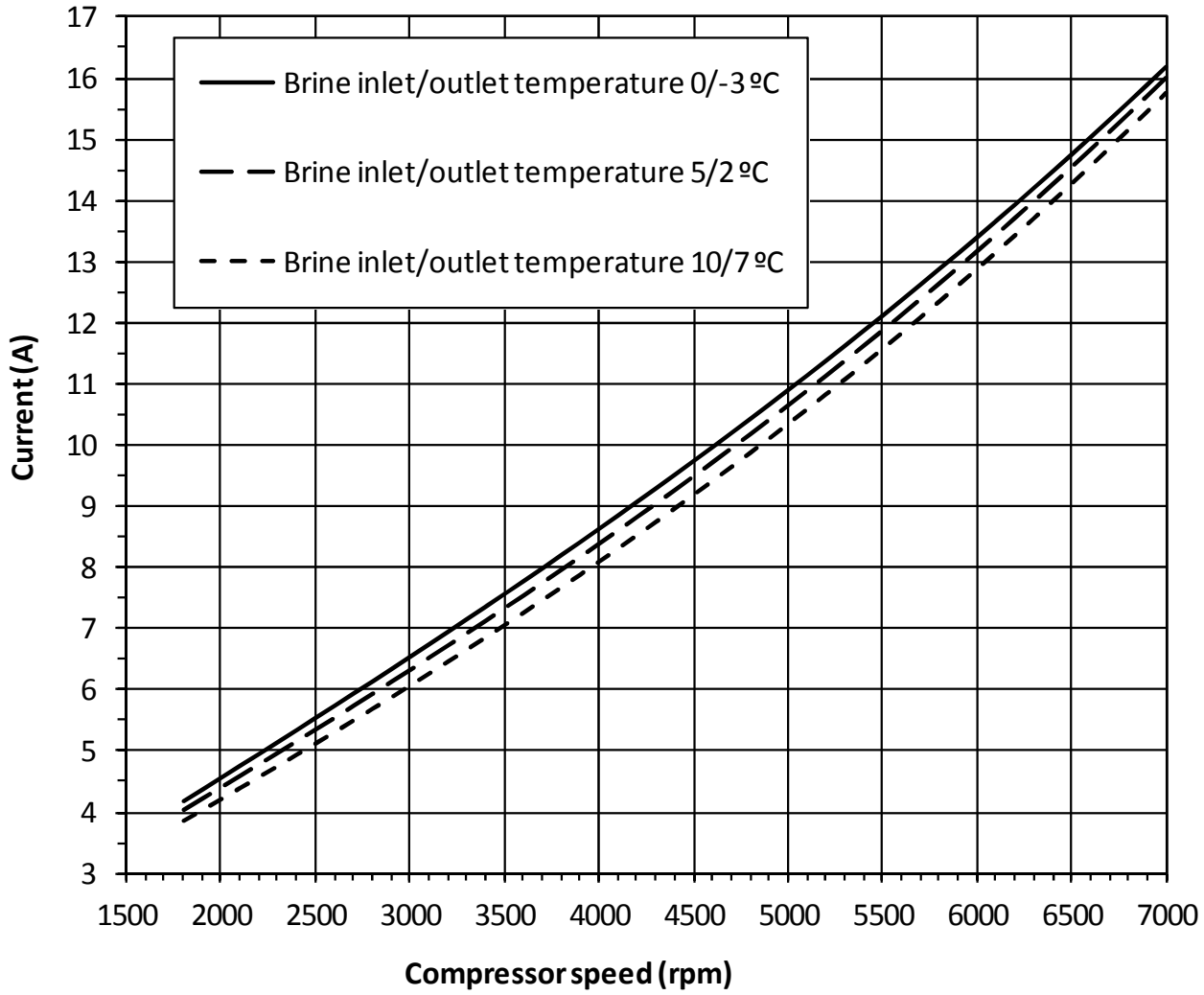


Figure 12.21. Electric power consumption of ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35ºC.

Figure 12.22 shows the power consumption of ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm) for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC and for inlet/outlet temperatures in the heating circuit of 40/45 ºC.

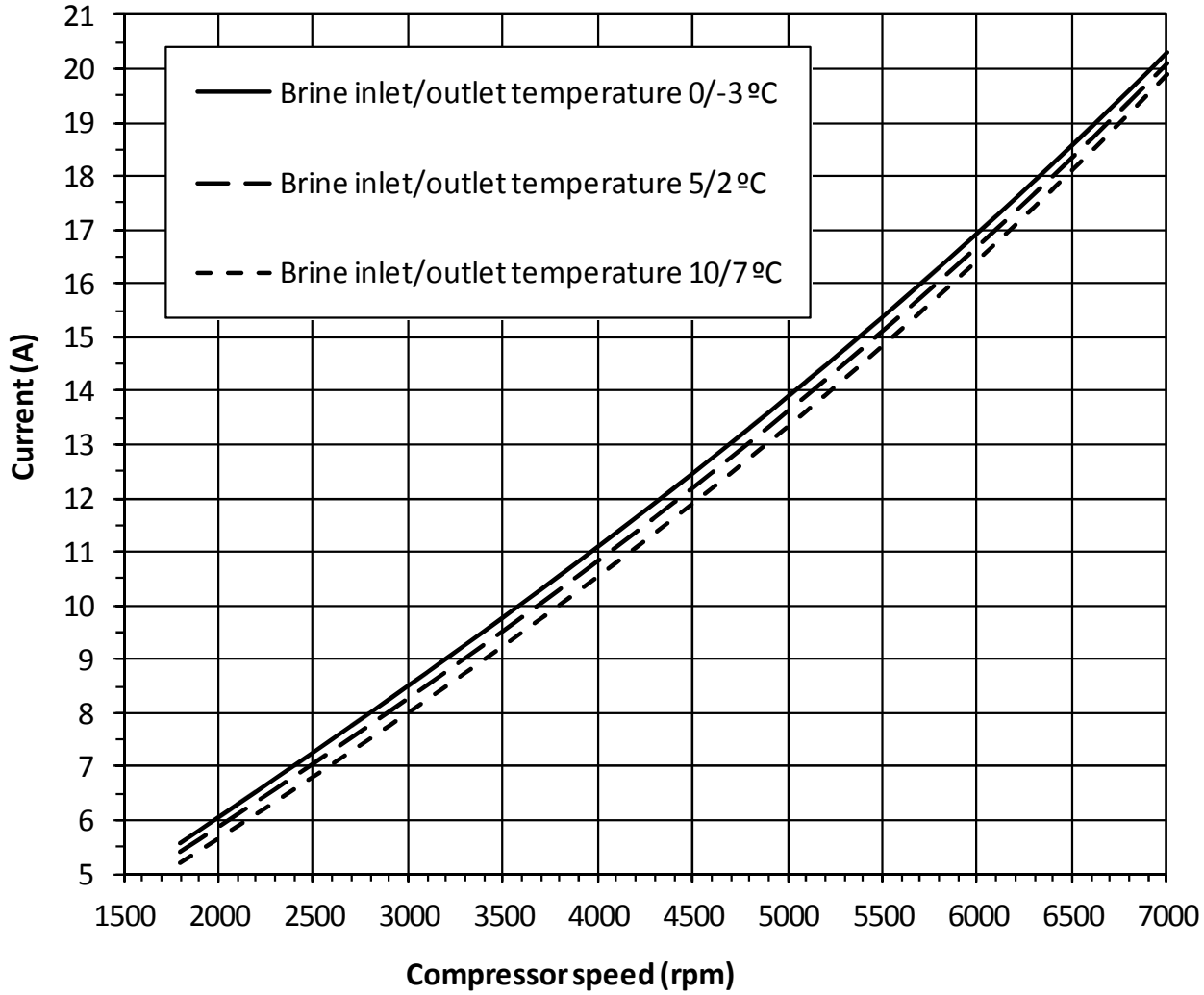


Figure 12.22. Power consumption of ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW and ecoGEO B3 3-12 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45 ºC.

Figure 12.23 shows the power consumption of ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35 ºC.

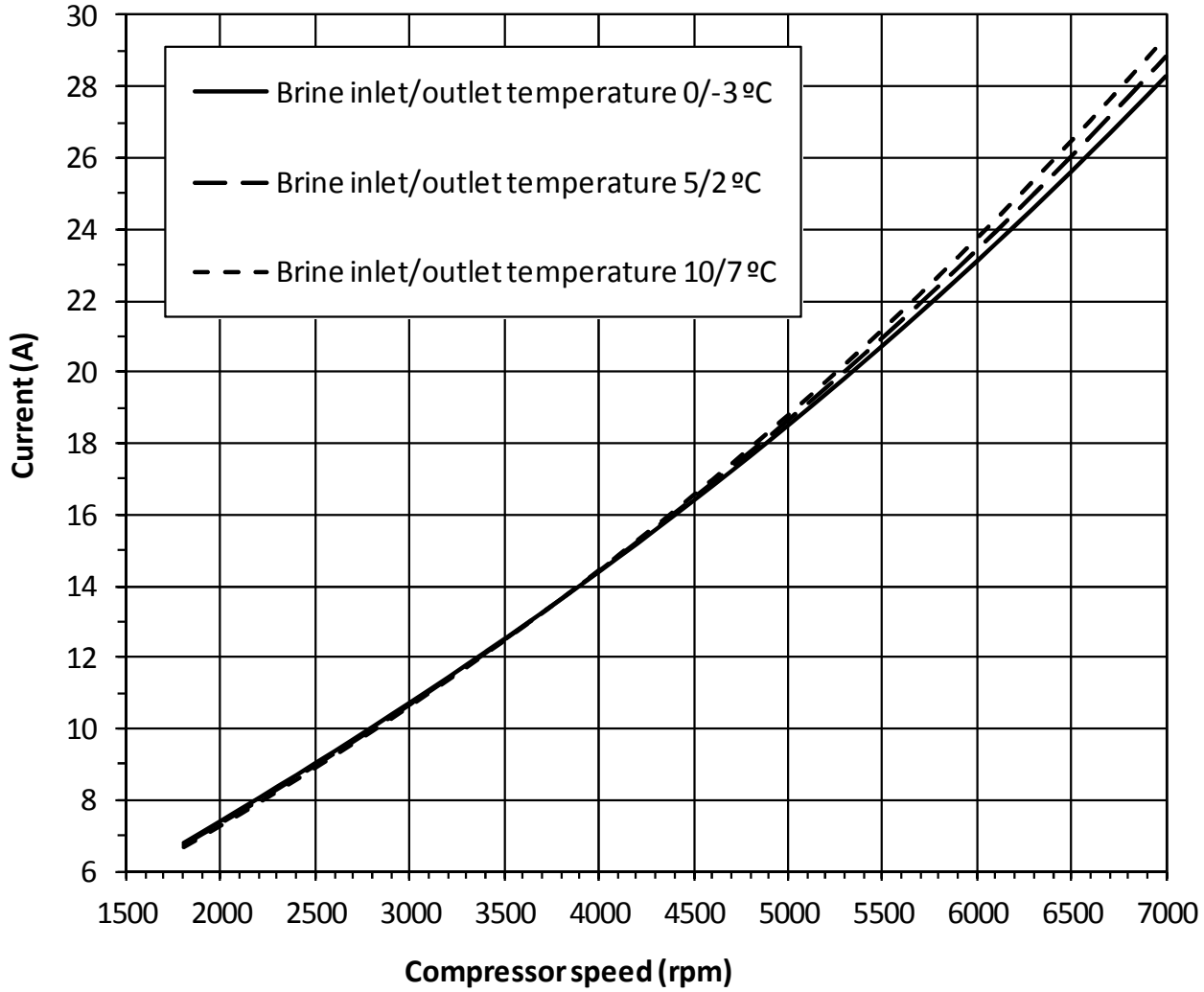


Figure 12.23. Power consumption of ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35 ºC.

Figure 12.24. shows the power consumption of ecoGEO B1 3-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45 ºC.

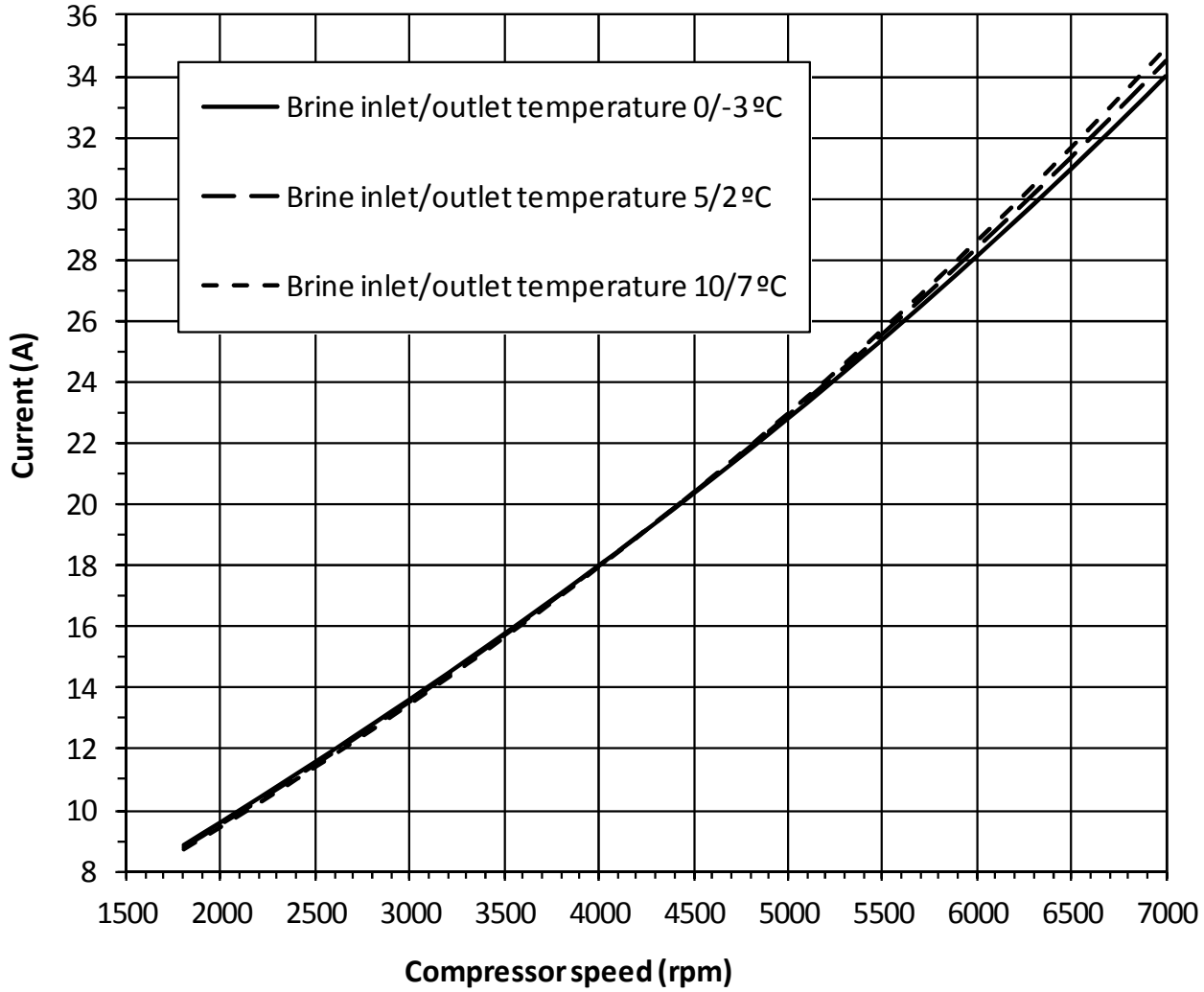


Figure 12.24. Power consumption of ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with single-phase electric power supply (230 V / 50 Hz, 1/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45 ºC.

Figure 12.25 shows the power consumption of ecoGEO B1 3-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 30/35 ºC.

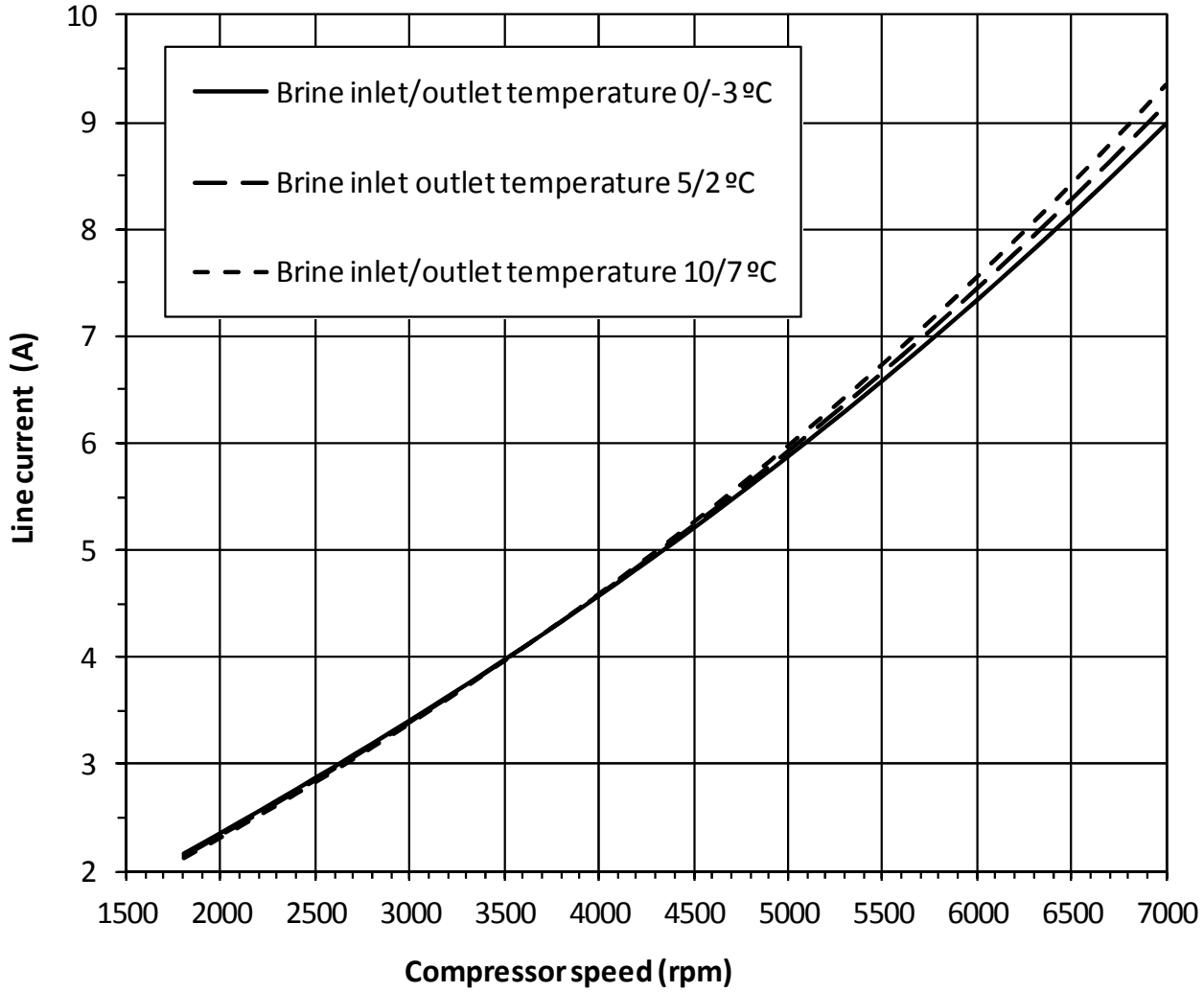


Figure 12.25. Power consumption of ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~) as a function of the compressor rotational speed (rpms), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet outlet temperatures in the heating circuit of 30/35 ºC.

Figure 12.27 shows the power consumption of ecoGEO B1 3-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and inlet/outlet temperatures in the heating circuit of 40/45 ºC.

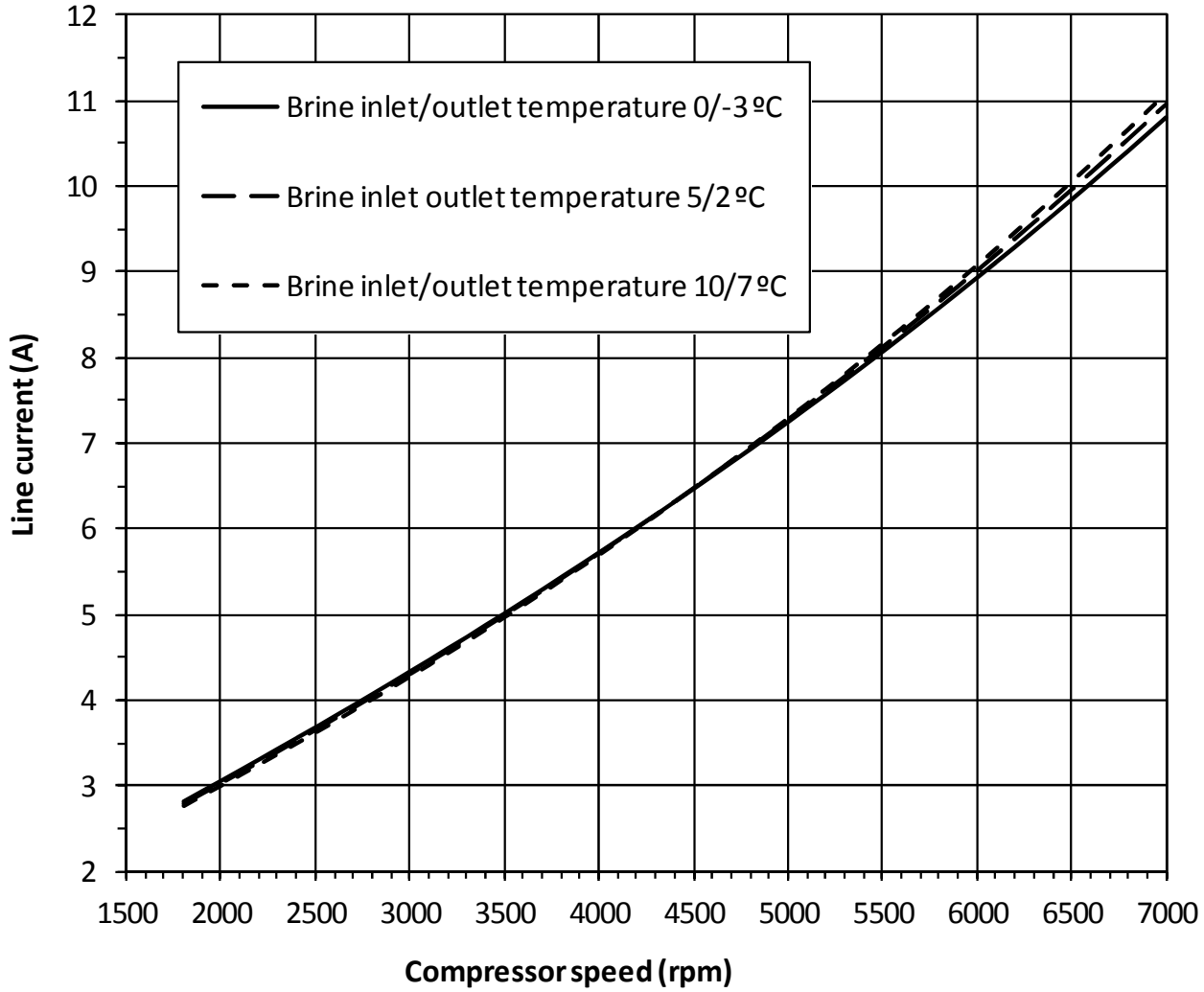


Figure 12.26. Power consumption of ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps with three-phase electric power supply (400 V / 50 Hz, 3/N/PE~) as a function of the compressor rotational speed (rpm), for inlet/outlet temperatures in the brine circuit of 0/-3, 5/2 and 10/7 ºC, and for inlet/outlet temperatures in the heating circuit of 40/45 ºC.

12.8. OPERATING ENVELOPE OF THE HEAT PUMPS

The operating envelope of heat pump shows conditions of operation for the heat pump as a function of the outlet temperatures in the brine and heating circuits. Figure 12.27 shows the operating envelope for ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW, ecoGEO B3-12 kW, ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B5-22 kW heat pumps.

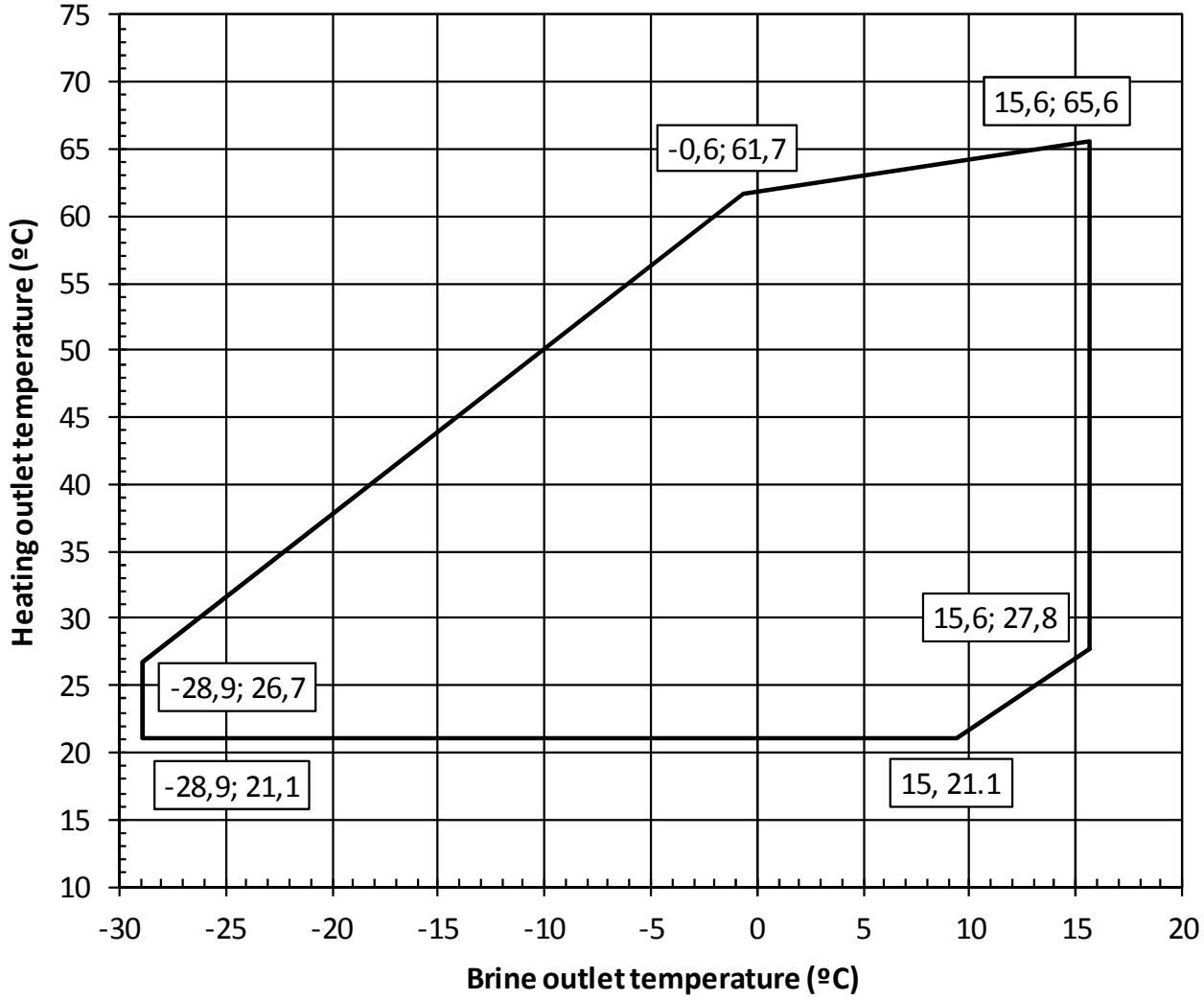


Figure 12.27. Operating envelope of ecoGEO B heat pumps as a function of the outlet temperatures in the brine and heating circuits.

12.9. PRESSURE DROP IN HEAT EXCHANGERS

Figure 12.28 shows water pressure drops in the condenser and glycol pressure drop in the evaporator of ecoGEO B1 3-12 kW heat pumps as a function of the flow rate.

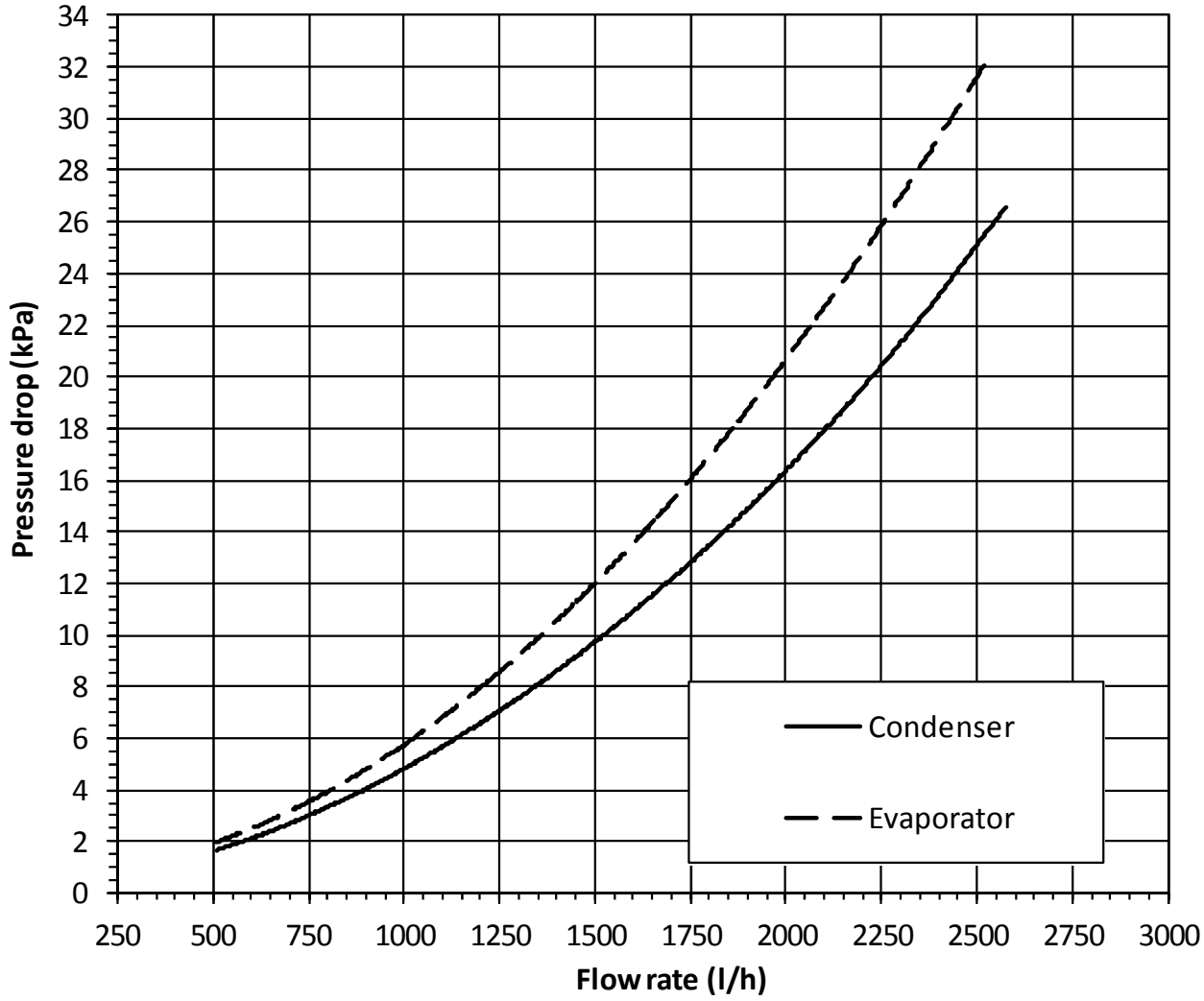


Figure 12.28. Pressure drops in heat exchangers for models ecoGEO B1 3-12 kW as a function of the flow rate.

Figure 12.29 shows water pressure drops in the condenser and free cooling heat exchanger and glycol pressure drops in the evaporator of ecoGEO B2 3-12 kW heat pumps as a function of the flow rate.

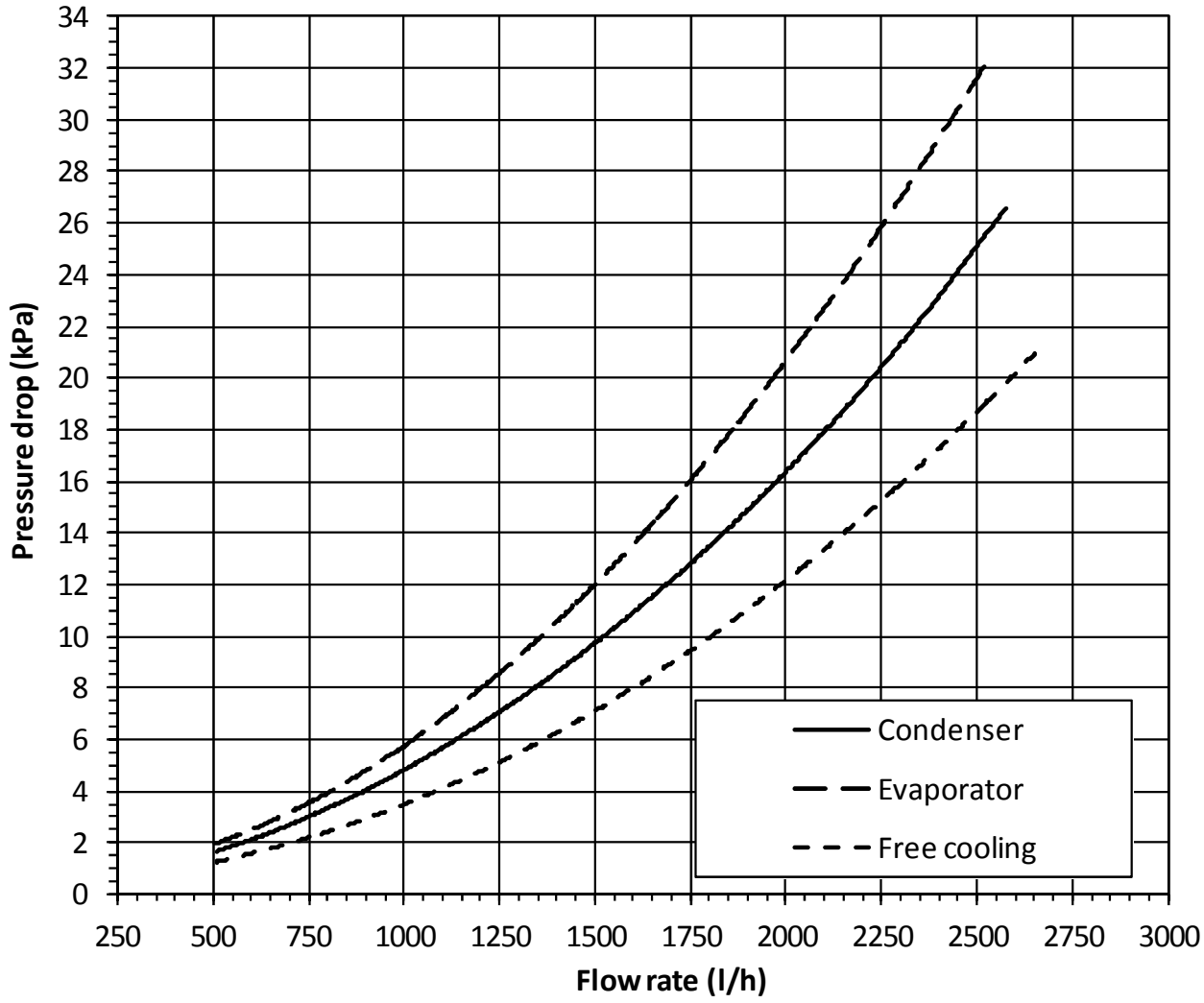


Figure 12.29. Pressure drop in heat exchanger of models ecoGEO B2 3-12 kW heat pumps as a function of the flow rate.

Figure 12.30 shows water pressure drops in the condenser and glycol in the evaporator of ecoGEO B3 3-12 kW heat pumps as a function of the flow rate.

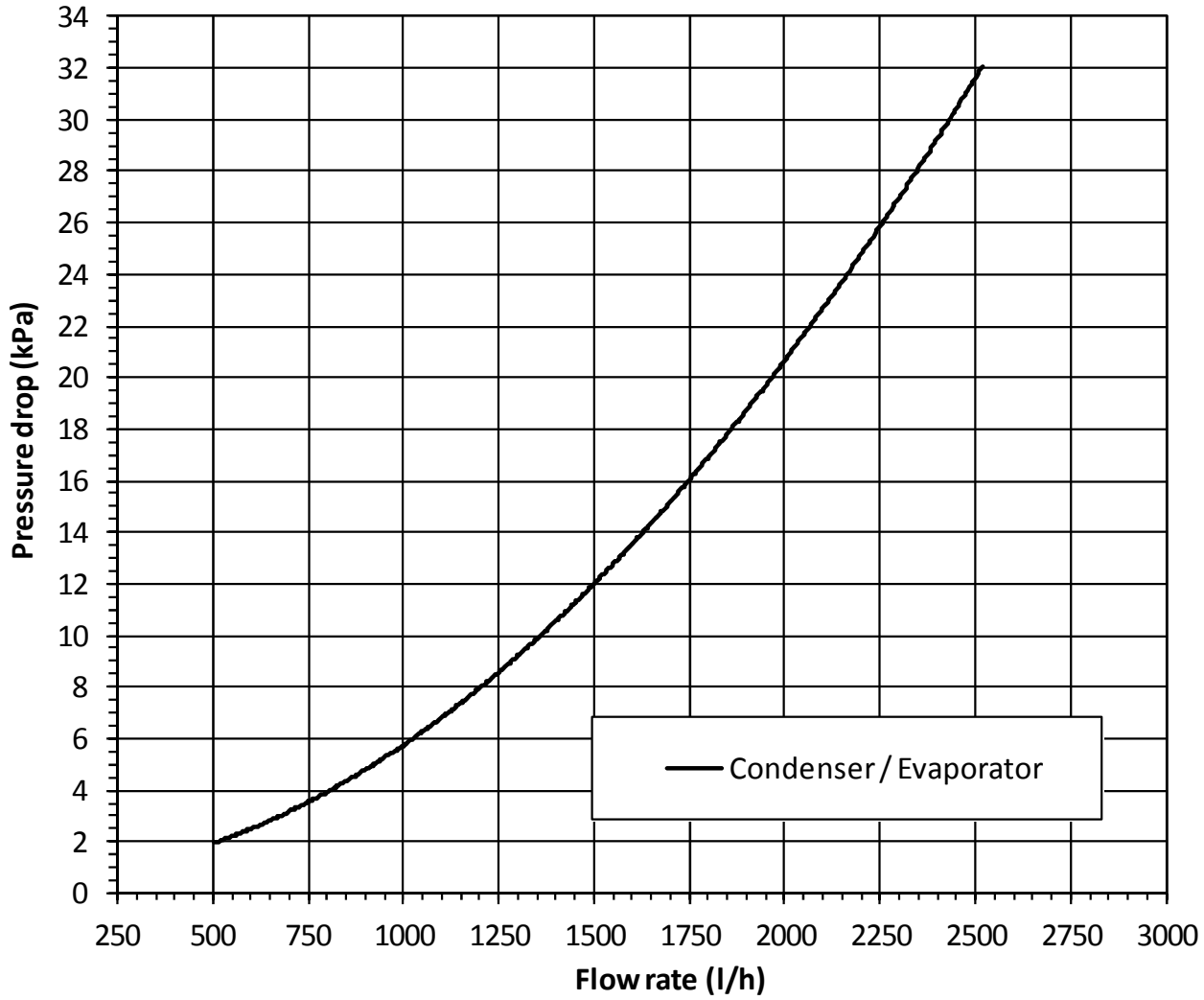


Figure 12.30. Pressure drops in heat exchangers of ecoGEO B3 3-12 kW heat pumps as a function of the flow rate.

Figure 12.31 shows water pressure drops in the condenser and glycol in the evaporator of ecoGEO B1 5-22 kW as a function of the flow rate.

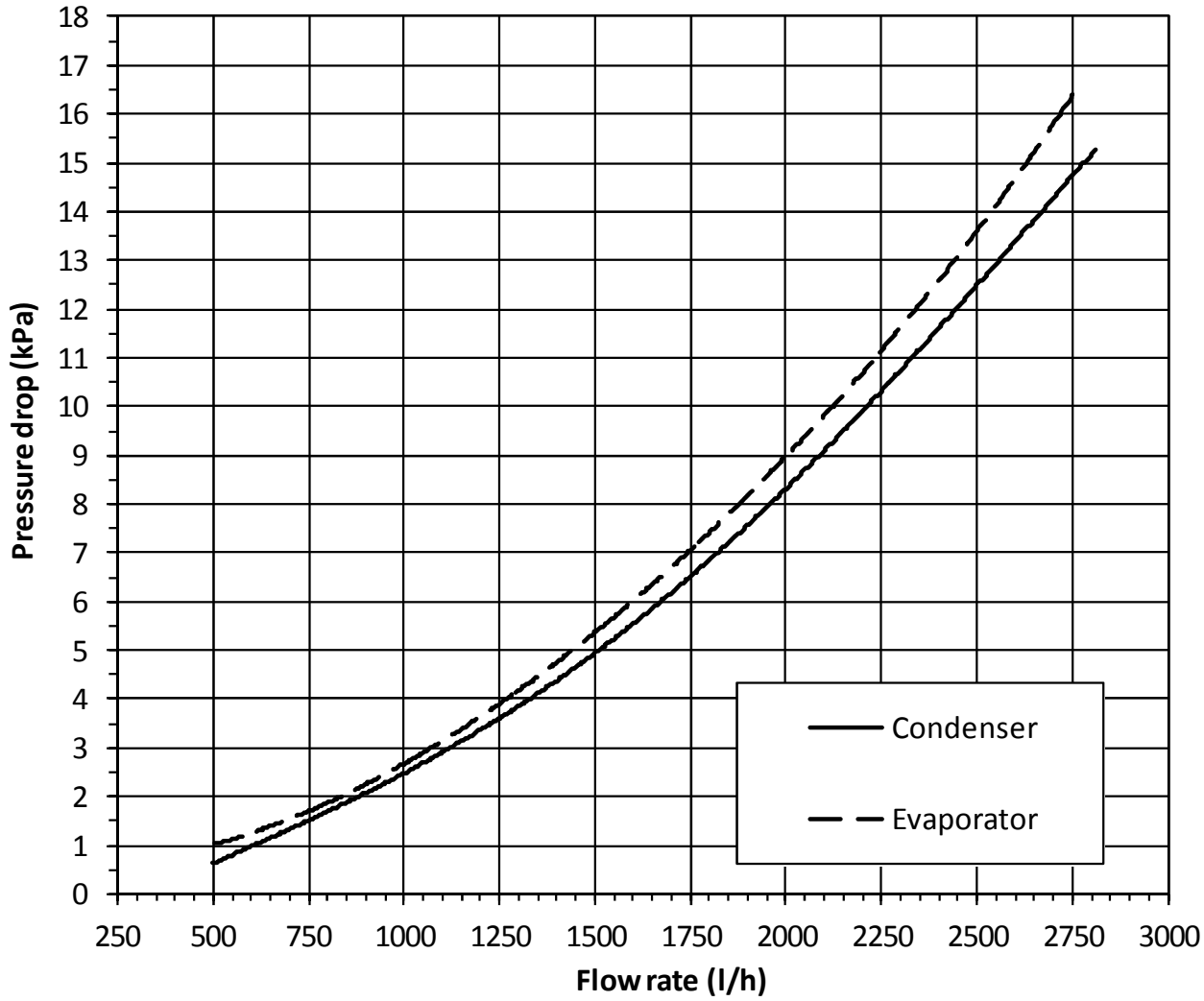


Figure 12.31. Pressure drops in heat exchangers of ecoGEO B1 5-22 kW models as a function of the flow rate.

Figure 12.32 shows water pressure drops in the condenser and free cooling heat exchanger and glycol pressure drops in the evaporator of ecoGEO B2 5-22 kW heat pumps as a function of the flow rate.

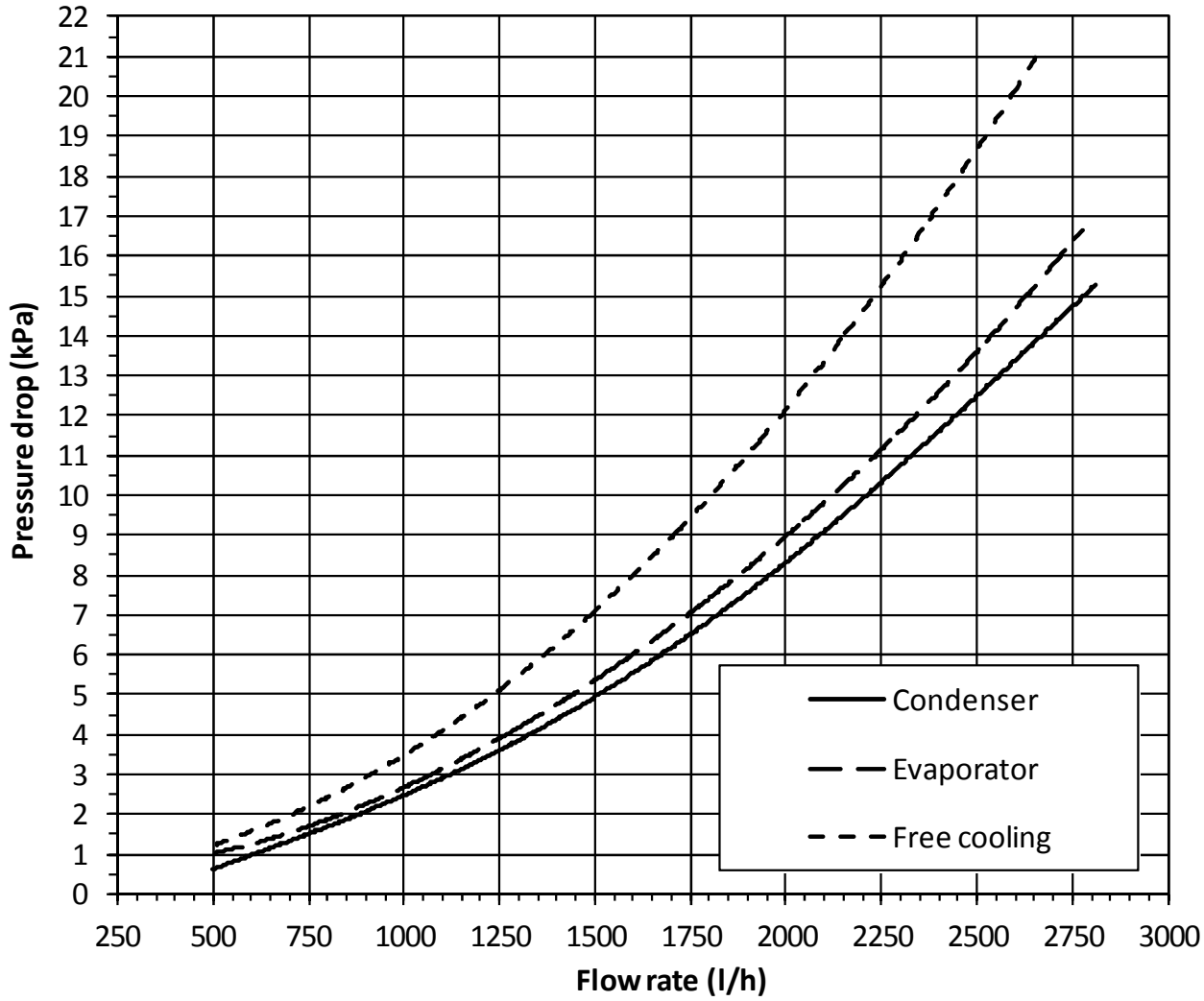


Figure 12.32. Pressure drops in heat exchangers of ecoGEO B2 5-22 kW models as a function of the flow rate.

Figure 12.33 shows water pressure drops in the condenser and glycol in the evaporator of ecoGEO B3 5-22 kW heat pumps as a function of the flow rate.

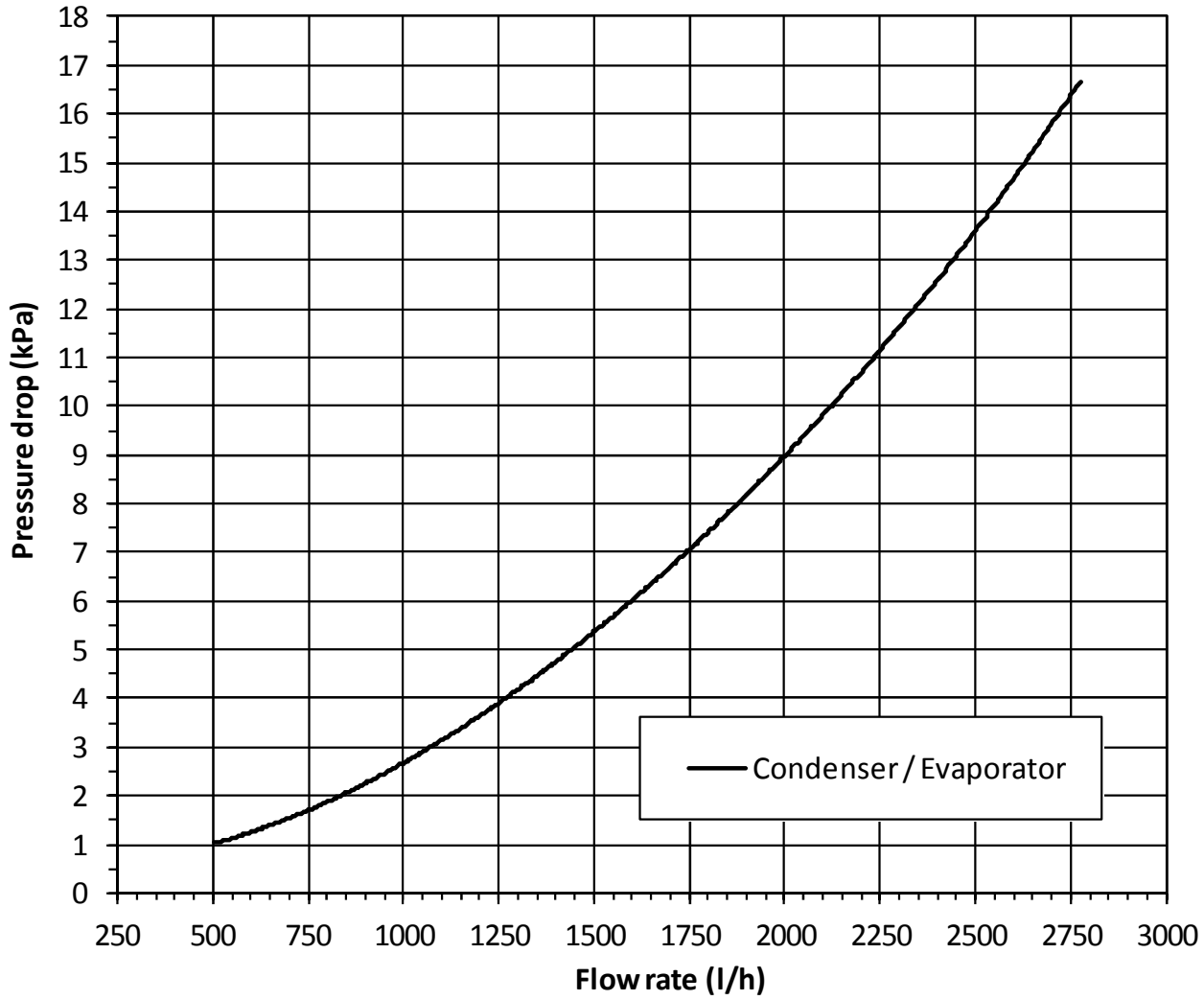


Figure 12.33. Pressure drops in heat exchangers of ecoGEO B3 5-22 kW models as a function of the flow rate.

12.10. PERFORMANCE CURVES OF CIRCULATION PUMPS

Figure 12.34 shows performance curves of circulation pumps in the brine and heating-cooling circuits of ecoGEO B1 3-12 kW, ecoGEO B2 3-12 kW, ecoGEO B3-12 kW, ecoGEO B1 5-22 kW, ecoGEO B2 5-22 kW and ecoGEO B3 5-22 kW heat pumps. The chart at the top shows the pumping height provided by the circulation pump as a function of the flow rate for different regulation signals (0-10 V). The chart at the bottom shows the power consumption of the circulation pump as a function of the flow rate for different regulation signals (0-10 V).

Charts in Figure 12.34 have been obtained from the manufacturer catalogue.

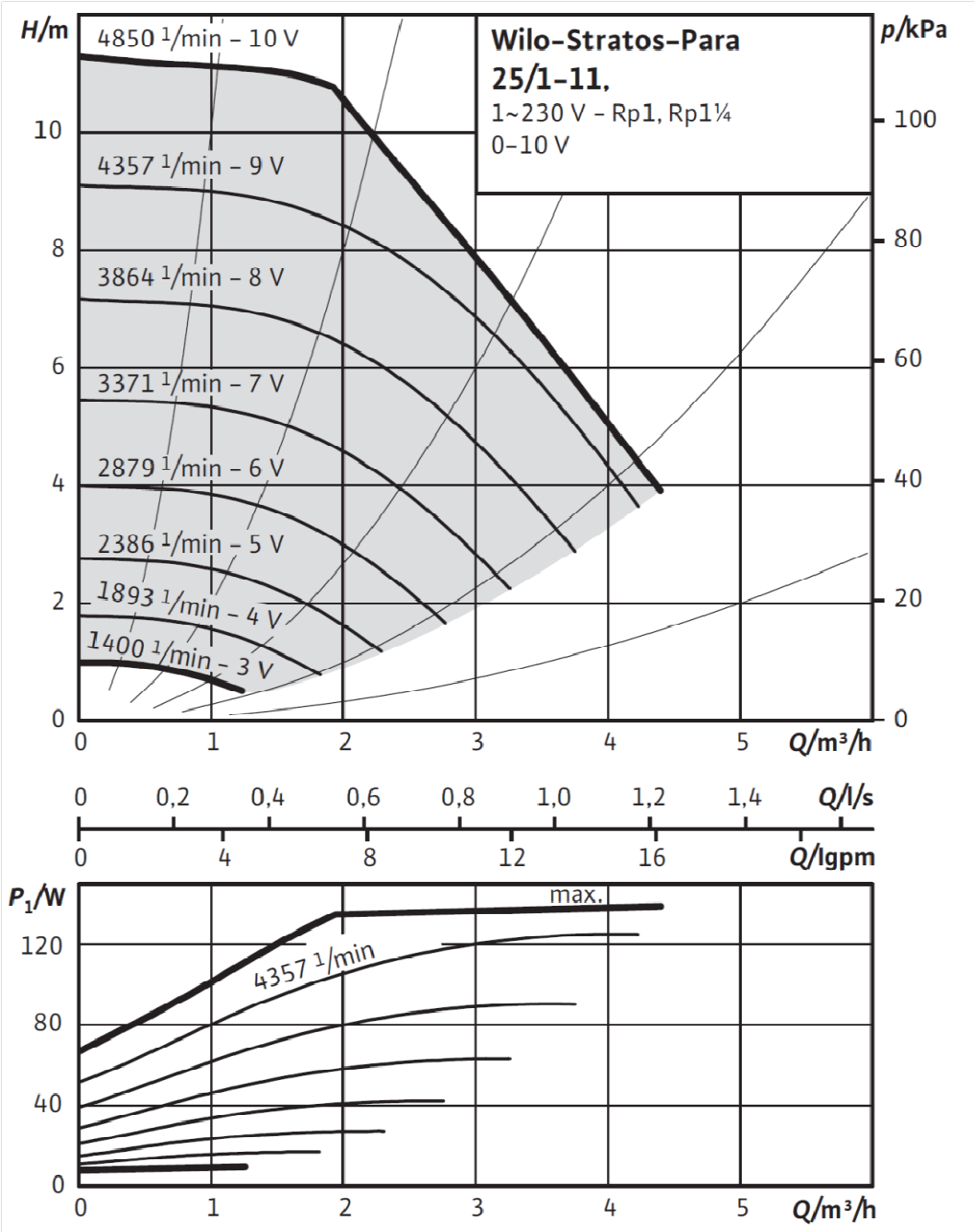


Figure 12.34. Performance curves of circulation pumps in the brine and heating-cooling circuits of ecoGEO B (Wilo Stratos PARA 25/1-11 0-10 V) heat pumps.

Figure 12.35 shows the performance curves of the circulation pump in the hot water circulation system in ecoGEO B3 3-12 kW and ecoGEO B3 5-22 kW heat pumps. The chart at the top shows the pumping height provided by the circulation pump as a function of the flow rate for the three rotational speeds available. The chart at the bottom shows the power consumption of the circulation pump as a function of the flow rate for the three rotational speeds available.

Charts in Figure 12.35 have been obtained from the manufacturer catalogue.

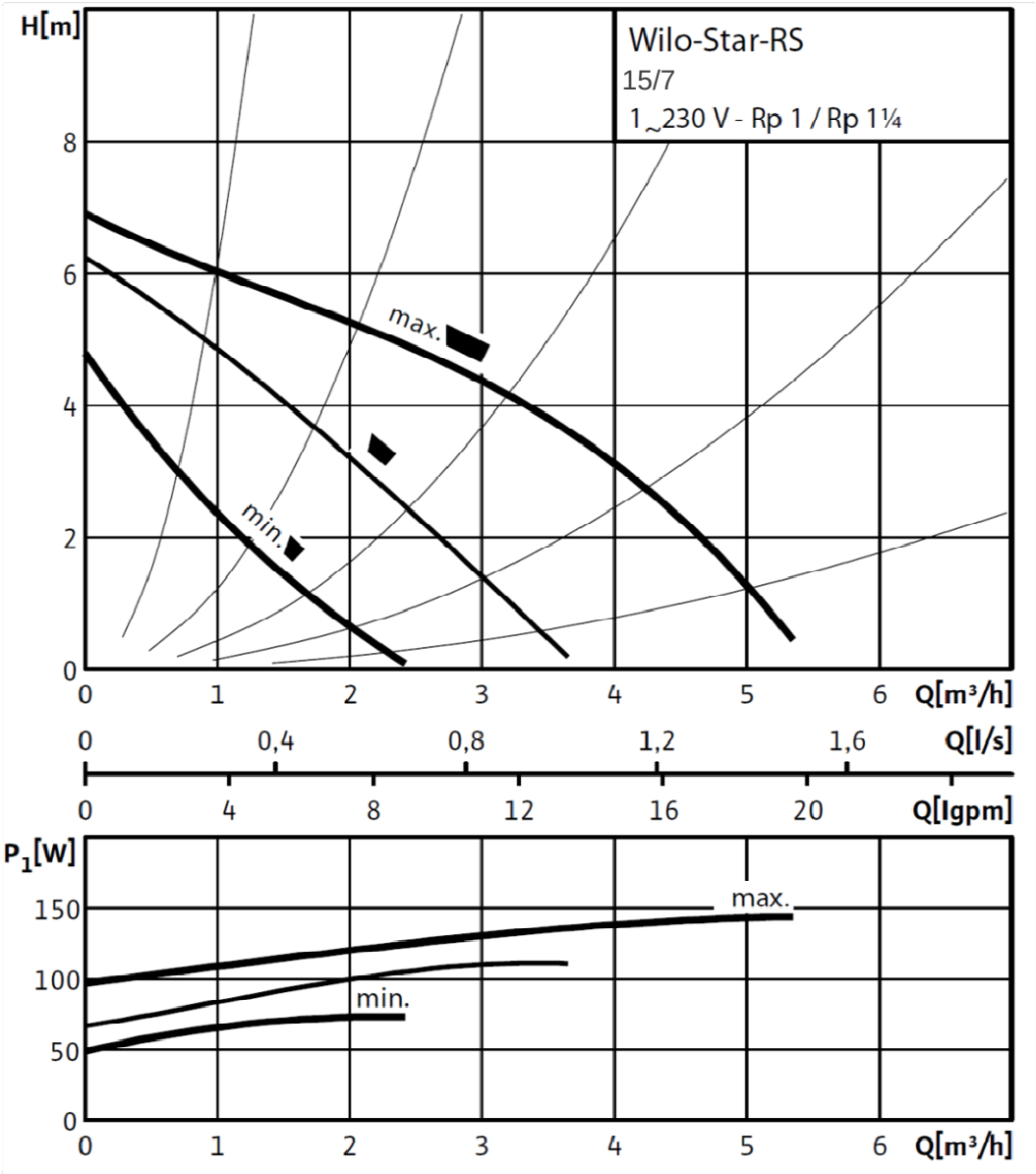


Figure 12.35. Performance curves of the circulation pump in the hot water circulation system of ecoGEO B3 3-12 kW and ecoGEO B3 5-22 kW (Wilo Star RS 15/7 3P) heat pumps.

13. SPECIFIC INSTALLATION DETAILS FOR ECOGEO B HEAT PUMPS

EcoGEO heat pumps are designed to supply comprehensive heating-cooling and to produce domestic hot water (DHW) throughout the year by means of a simple installation and guaranteeing as much energy efficiency as possible.

- **HIGHEST ENERGY EFFICIENCY**

  Due to their wide capacity regulation range, ecoGEO heat pumps can be adapted to the needs of thermal energy to produce DHW, heating or cooling. The inverter technology compressor as well as the brine and heating-cooling pumps of high efficiency and variable speed allow producing the best flow and temperature at any time, so that the heat pump always works in the highest conditions of energy efficiency. Moreover, ecoGEO heat pumps inverter regulation allows minimizing the equipment start/stop cycles, which produce highest energy efficiency.

- **EASY AND INEXPENSIVE INSTALLATION**

  The regulation capacity and supply temperature provided by ecoGEO heat pumps allow simplifying significantly the heating-cooling installation. In simple installations as well as in those implying heating-cooling systems using under-floor, fancoils or low temperature radiators, it is not necessary to have a buffer tank. Moreover, ecoGEO heat pumps allow to produce up to two different supply temperatures just by adding an external shunt group (modulating mixing valve + pump) controlled by the heat pump itself and, therefore, without the need to use any additional regulation systems.

  These aspects allow to simplify installation and to reduce costs significantly.

13.1. SUGGESTIONS FOR THE HEATING-COOLING CIRCUIT INSTALLATION

EcoGEO heat pumps can operate directly connected to the heating-cooling system (1 ZONE and 2 ZONE schemes) or connected to an intermediate buffer tank (BUFFER TANK scheme). To allow the best performance of interior comfort and optimize its energy efficiency it is suggested to connect the heat pump directly to the heating-cooling system and control the interior temperature using indoor th-Tune type terminals.

- **MINIMUM CIRCULATION FLOW**

The heating-cooling installation must be designed so that it guarantees the flow circulation through the heat pump when the compressor is running. In installations with direct connection to the heating-cooling system it is suggested to control temperature using one (1 ZONE) or two (2 ZONE) th-Tune terminals placed in the main spaces of each zone, leaving the circuits of these spaces open. This way, the circulation flow through the heat pump is guaranteed without prejudice of interior comfort conditions, since the heat pump provides de best room temperature control of spaces regulated by th-Tune terminals. The temperature in other rooms may be controlled individually using zone valves controlled by thermostats.

If room control is accomplished by the use of relay type thermostats connected in parallel, so that all the heating-cooling system circuits can be closed simultaneously, it necessary the installation of a device which guarantees a minimum flow through the heat pump, such as the following ones:

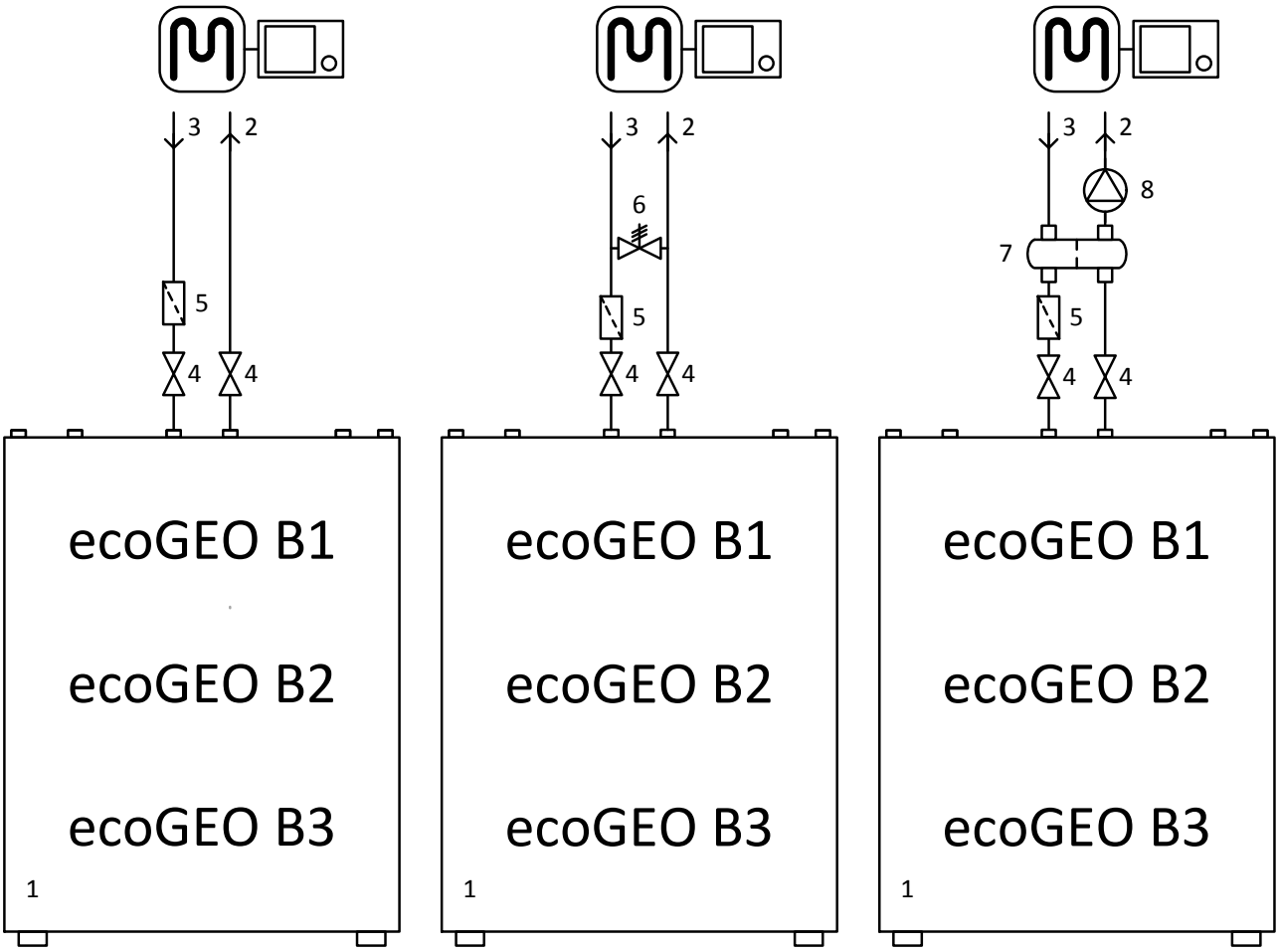
- **DIFFERENTIAL PRESSURE VALVE**

  It must be installed between the heat pump supply and return and it opens when the difference of pressure between both circuits exceeds the value set in the valve. This way, when heating-cooling system circuits are closed, the valve guarantees the minimum circulation flow through the heat pump.

■ **HYDRAULIC SEPARATOR**

It allows to separate hydraulically the production (heat pump) and consume (heating-cooling system) of thermal energy. In such a way, the minimum circulation flow is guaranteed regardless of the heating-cooling system involved.

Figure 13.1 shows the different types of connection schemes of the heat pump to the heating-cooling system.



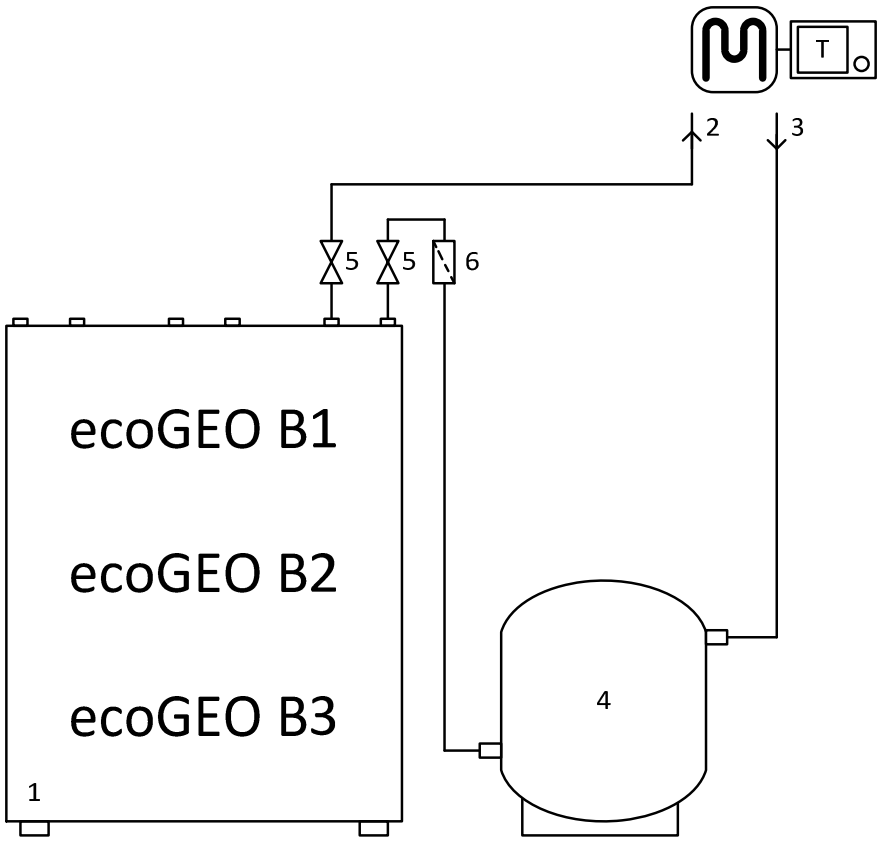
No	Description	No	Description
1	Heat pump	5	Strainer
2	Heating-cooling outlet, (G1'' H)	6	Differential pressure valve
3	Heating-cooling inlet, (G1'' H)	7	Hydraulic separator
4	Shut-off valve	8	Circulation pump

Figure 13.1. General scheme of connections in the heating-cooling circuit.

In installations using an intermediate buffer tank (BUFFER TANK scheme), the tank allows the hydraulic separation of thermal energy supply (heat pump) and consumption (heating-cooling system). Hence, flow circulation through the heat pump is guaranteed, since it is independent from the control system of the heating-cooling installation.

■ **SERIAL BUFFER TANK**

In installations using a direct connection (1 ZONE and 2 ZONE schemes) where the smaller open circuit that can lead the functioning of the heat pump has a volume of less than 50 liters water, it is suggested to connect a serial buffer tank in the return circuit of heating-cooling system to the heat pump.



No	Description	No	Description
1	Heat pump	4	Buffer tank
2	Heating-cooling outlet, (G1'' H)	5	Shut-off valve
3	Heating-cooling inlet, (G1'' H)	6	Strainer

Figure 13.2. Scheme of heating-cooling system connections using a serial buffer tank in the return circuit.

■ **HEATING EMISSION SYSTEMS**

Geothermal heat pumps in general and ecoGEO heat pumps in particular provide the highest energy efficiency when they are used in heating systems using low temperature thermal emitters. This makes it the ideal choice to install heat systems using under-floor as release system, since they require low supply temperatures (between 30 and 35 ºC).

However, ecoGEO heat pumps allow the use of release systems which require supply temperatures up to 55 ºC, so that they can be used in heating systems that use fancoils, convection heaters or low temperature radiators. In this type of installations, ecoGEO heat pumps also guarantee the highest energy efficiency. However it must be taken into account that the increase of supply temperature in the heating system rises the energy consumption level needed to heat water and, therefore, the energy efficiency to be obtained by the heat pump decreases. Thus, an increase in the supply temperature between 35 ºC and 50 ºC implies a decrease in energy efficiency next to 25%. In order to mitigate this effect, it is suggested to oversize the thermal issuers of the heating system to reduced as much as possible the supply temperature needed and/or increase the thermal insulation of the building.

- **COOLING EMISSION SYSTEMS**

  In case of using under-floor to supply free cooling or active cooling, special care must be taken in the design and control of the installation, since condensation problems on the floor may occur.

- **MIXING VALVE**

EcoGEO heat pumps, thanks to its inverter technology compressor, allow the best control of supply temperature to the heating-cooling system. For this reason, it must be avoided the installation of mixing valves at the heat pump outlet to control the supply temperature, since it reduces its energy efficiency.

14. RECOMMENDED APPLICATIONS

This section includes some examples of recommended installations for ecoGEO B1, ecoGEO B2 and ecoGEO B3 heat pumps. Note that the installation examples that follow below are only a draft outline and that some additional elements (valves, joint elements, etc.) may be needed. The installation design must be accomplished by technical staff and follow the local applicable law and regulations.

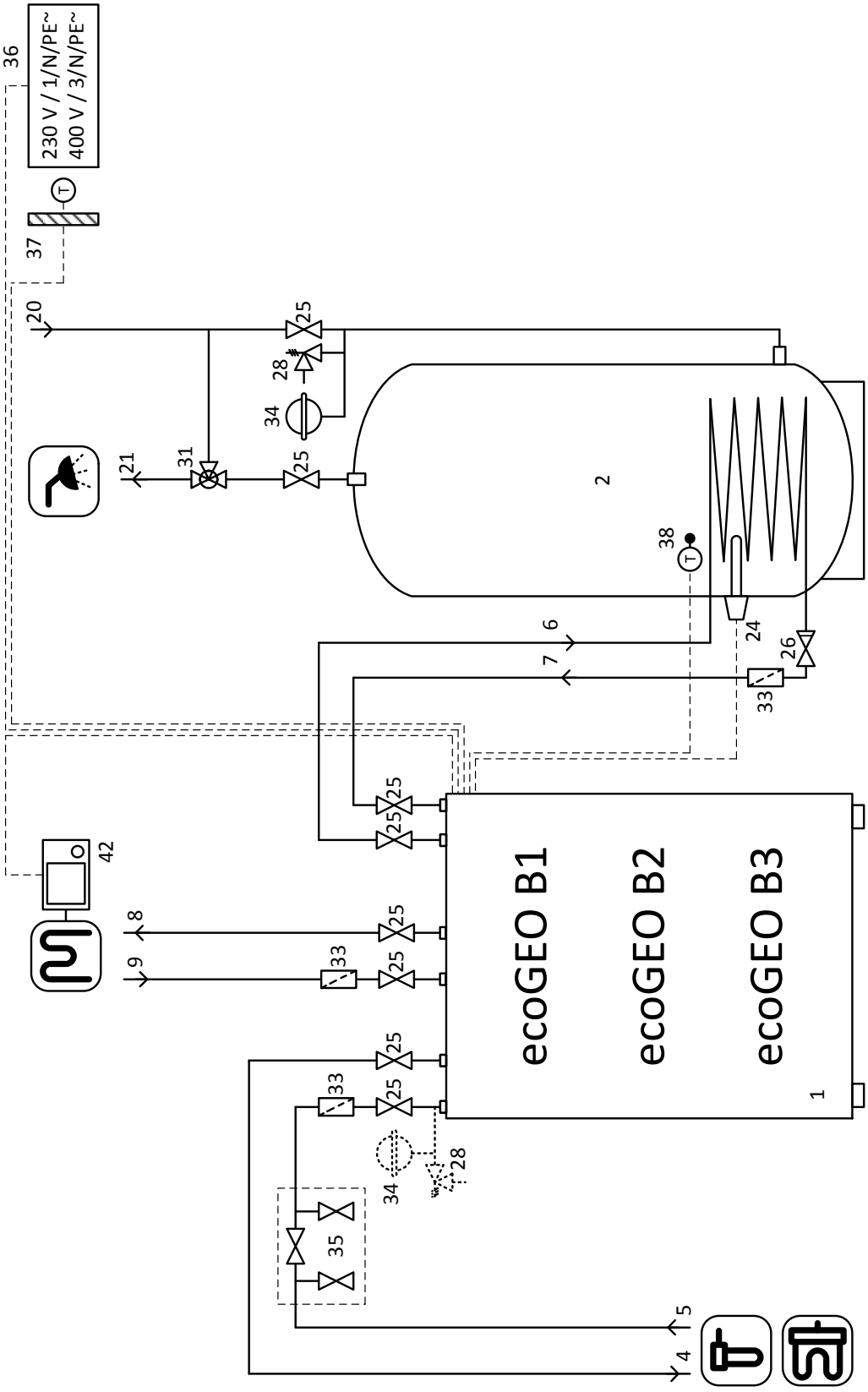
14.1. COMPONENT LEGENDS

Table 14.1 shows the component legends for the installation schemes recommended as listed below.

Nº	Description	Nº	Description
1	Heat pump	22	Circulation pump
2	DHW tank	23	Pool heat exchanger
3	Buffer tank	24	Legionella protection electric heater
4	Brine outlet	25	Shut-off valve
5	Brine inlet	26	Check valve
6	DHW tank coil outlet	27	4-way valve On/Off
7	DHW tank coil inlet	28	Safety valve
8	Zone 1 outlet	29	2-way zone valve On/Off
9	Zone 1 inlet	30	3-way zone valve On/Off
10	Zone 2 outlet	31	Thermostatic mixing valve
11	Zone 2 inlet	32	3-way modulating valve
12	Heating system outlet	33	Strainer
13	Heating system inlet	34	Expansion vessel
14	Cooling system outlet	35	Brine filling fitting
15	Cooling system inlet	36	Power supply
16	Pool heat exchanger outlet	37	Outdoor temperature probe
17	Pool heat exchanger inlet	38	DHW tank temperature probe
18	Supply for Buffer tank	39	Buffer tank temperature probe
19	Return from Buffer tank	40	Outlet temperature probe Zone 2
20	Cold wate inlet	41	Pool chrono-thermostat
21	DHW outlet	42	Indoor terminal

Table 14.1. Component legends for the installation schemes recommended.

14.2. INSTALLATION IN 1 ZONE FOR ECOGEO B1, B2 AND B3



OPERATION

DHW Mode. Whenever DHW is demanded, the heat pump delivers hot water into the DHW inter-buffer heating coil until the temperature set point is reached (Maximum buffer temperature 50 ºC). In models ecoGEO B1 and B2 the hot water flow from the condenser is diverted to the inter-buffer heating coil through the 3-ways valve for heating/DHW. In ecoGEO B3 models the CHW system (Closed Hot Water production system) is activated and it allows the simultaneous supply of DHW and climate control. The heat pump always gives priority to DHW supply over other demands.

HEATING Mode. The heat pump directly delivers hot water to the heating system depending on demand. Supply temperature is optimized according to outdoor and indoor temperatures and the configuration of values in the climate control. Circulation pumps control the temperature range in supply and return in the brine and heating-cooling circuits between 3 and 5 ºC, respectively.

FREE COOLING Mode (ecoGEO B2 models). The compressor turns off, the circulation pumps are 100% active and climate control and brine circuits are diverted to the free cooling heat exchanger. Thus, the equipment directly pumps out cool water obtained through the thermal exchange with the antifreeze mixture of the brine system to the climate control system.

ACTIVE COOLING Mode (only ecoGEO B3 models). The heat pump reverses its operational cycle, so that it directly pumps out cold water to the climate control system. The temperature set value of supply depends on the release system used. Circulation pumps control the temperature range in supply and return in the brine and heating-cooling circuits between 3 and ºC, respectively.

LEGIONELLA PROTECTION Mode. If the LEGIONELLA PROTECTION mode is enabled, one a week, on the date and time set, the anti-legionella resistance placed in the DHW tank will be activated to increase its temperature up to 70 ºC in order to avoid legionella contamination

EXTERNAL CONTROL ELEMENTS

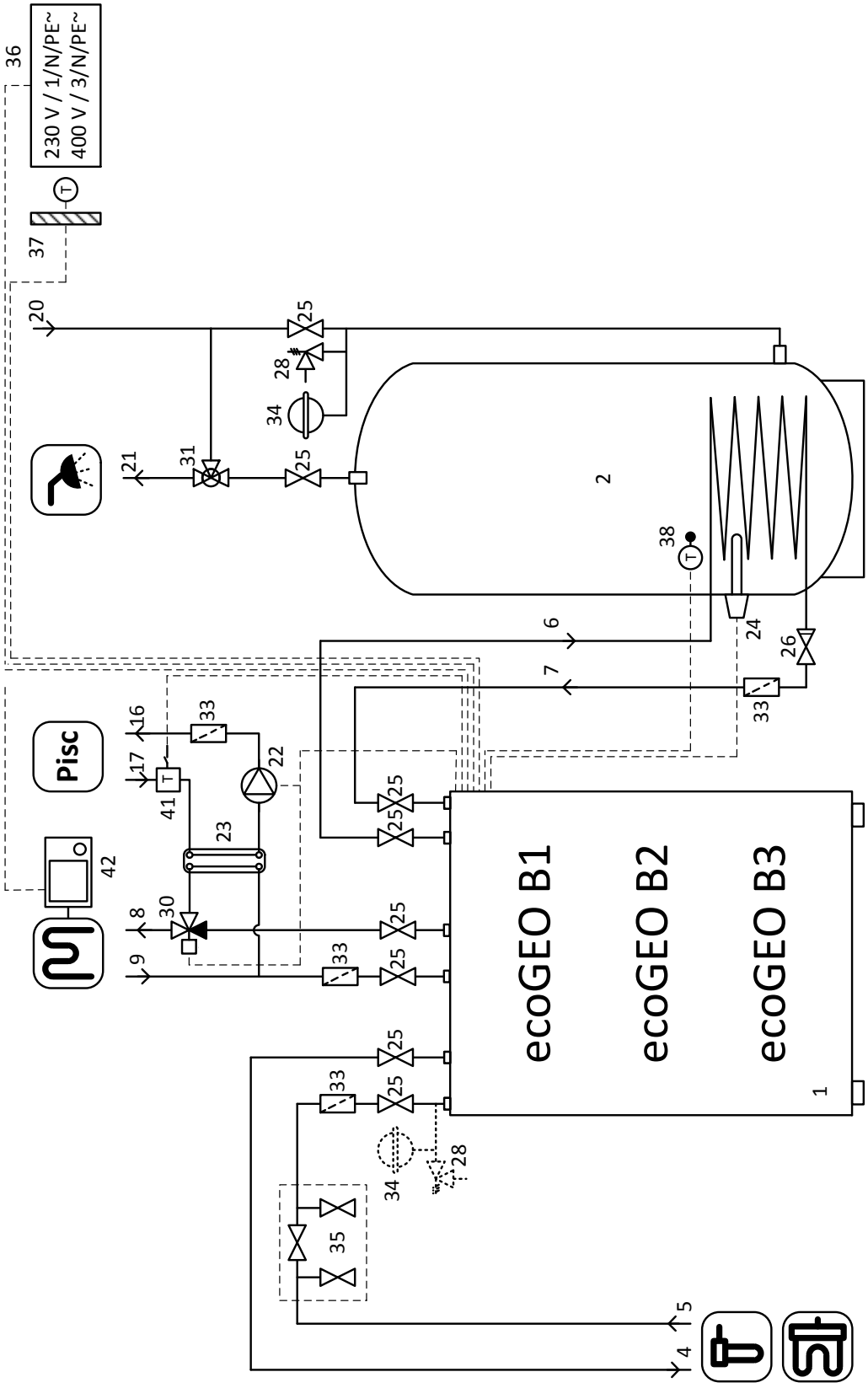
In addition to the own control equipments of the heat pump it is necessary the installation of the following components (see section 7).

- An indoor th-Tune climate terminal (only in case the heat pump control is done through a th-Tune terminal). Supplied with the heat pump.
- One or more relay type thermostats for indoor temperature control (only in case the heat pump control is done through a signal from the relay type thermostats).
- A temperature probe for outdoor temperature. Supplied with the heat pump.

NOTES

- Depending on the control system for climate control it may be necessary additional hydraulic components to guarantee the flow circulation through the heat pump (see section 6.1).

14.3. INSTALLATION IN 1 ZONE WITH POOL FOR ECOGEO B1, B2 AND B3



OPERATION

In addition to the standard operation of the heat pump in the 1 ZONE scheme (see section 14.2), the POOL mode is enabled.

POOL Mode. The heat pump directly delivers hot water to the pool heat exchanger acting on the pool 3-way deviation valve. The desired temperature supply is established by a preset value. Circulation pumps control the supply and return temperature range in the brine and heating-cooling circuits between 3 and 5 ºC, respectively. The pool demand is only satisfied if there are not DHW or climate control demands. Once started the POOL mode, no other climate control demands will be satisfied until the preset minimum time of operation in the heat pump configuration has been passed.

EXTERNAL CONTROL ELEMENTS

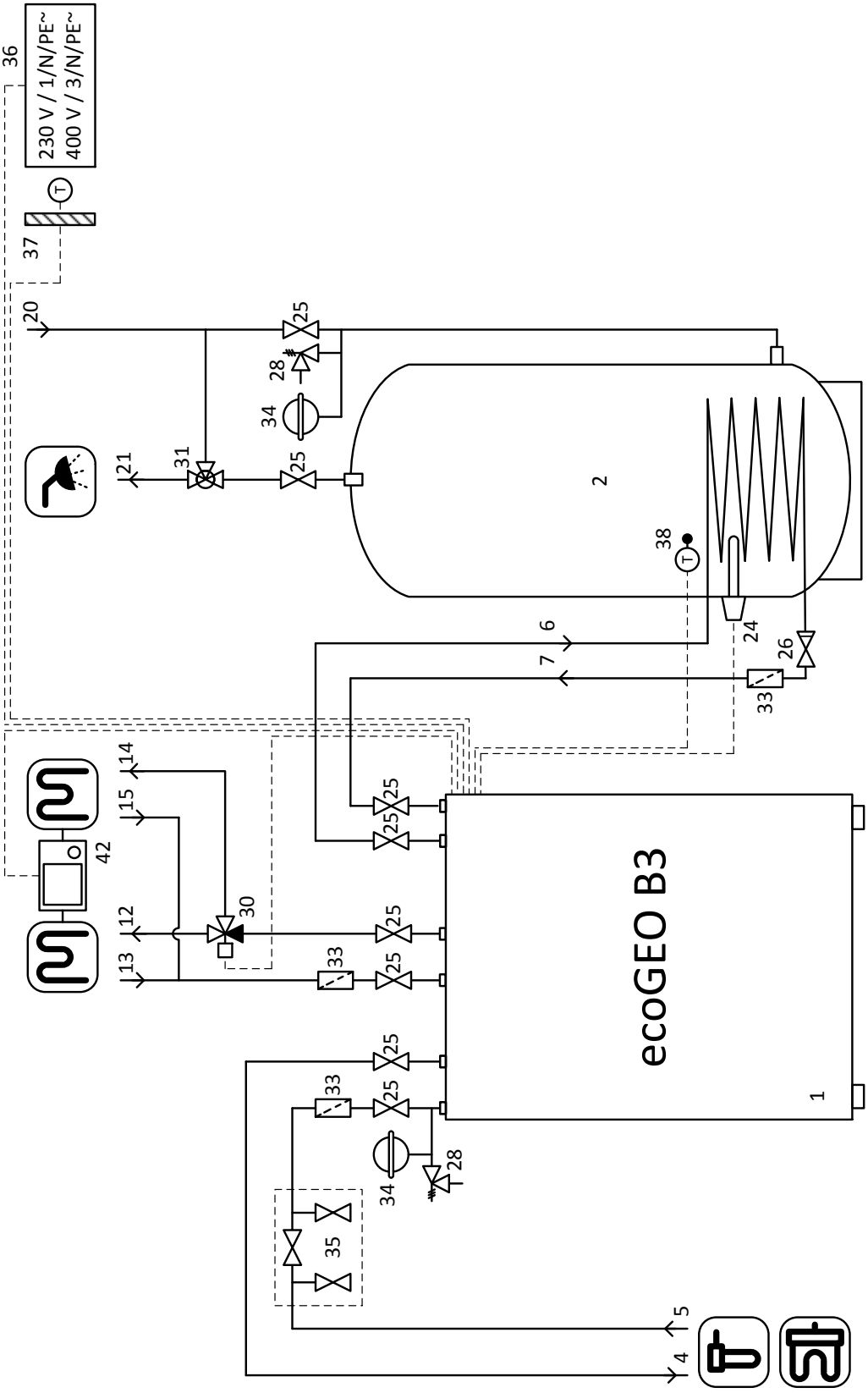
In addition to the own control equipments of the heat pump, it is necessary the installation of the following components (see section 7).

- An indoor th-Tune climate terminal (only in case the heat pump control is done through a th-Tune terminal). Supplied with the heat pump.
- One or more relay type thermostats for indoor temperature control (only in case the heat pump control is done through a signal from the relay type thermostats).
- A temperature probe for outdoor temperature. Supplied with the heat pump.
- A chrono-thermostat to active the POOL mode.
- A 3-way deviation valve to the pool heat exchanger

NOTES

- Depending on the control system for climate control it may be necessary additional hydraulic components to guarantee the flow circulation through the heat pump (see section 6.1).

14.4. INSTALLATION IN 1 ZONE WITH SEPARATE SYSTEMS FOR HEATING AND COOLING ECOGEO B3



■ OPERATION

The heat pump normally operates in the 1 ZONE scheme (see section 14.2).

When the heat pump operates in HEATING mode, the 3-way valves divert hot water flow to the heat release system and when it operates in ACTIVE COOLING mode, the 3-way valves divert cold water flow to the cold air release system.

■ EXTERNAL CONTROL ELEMENTS

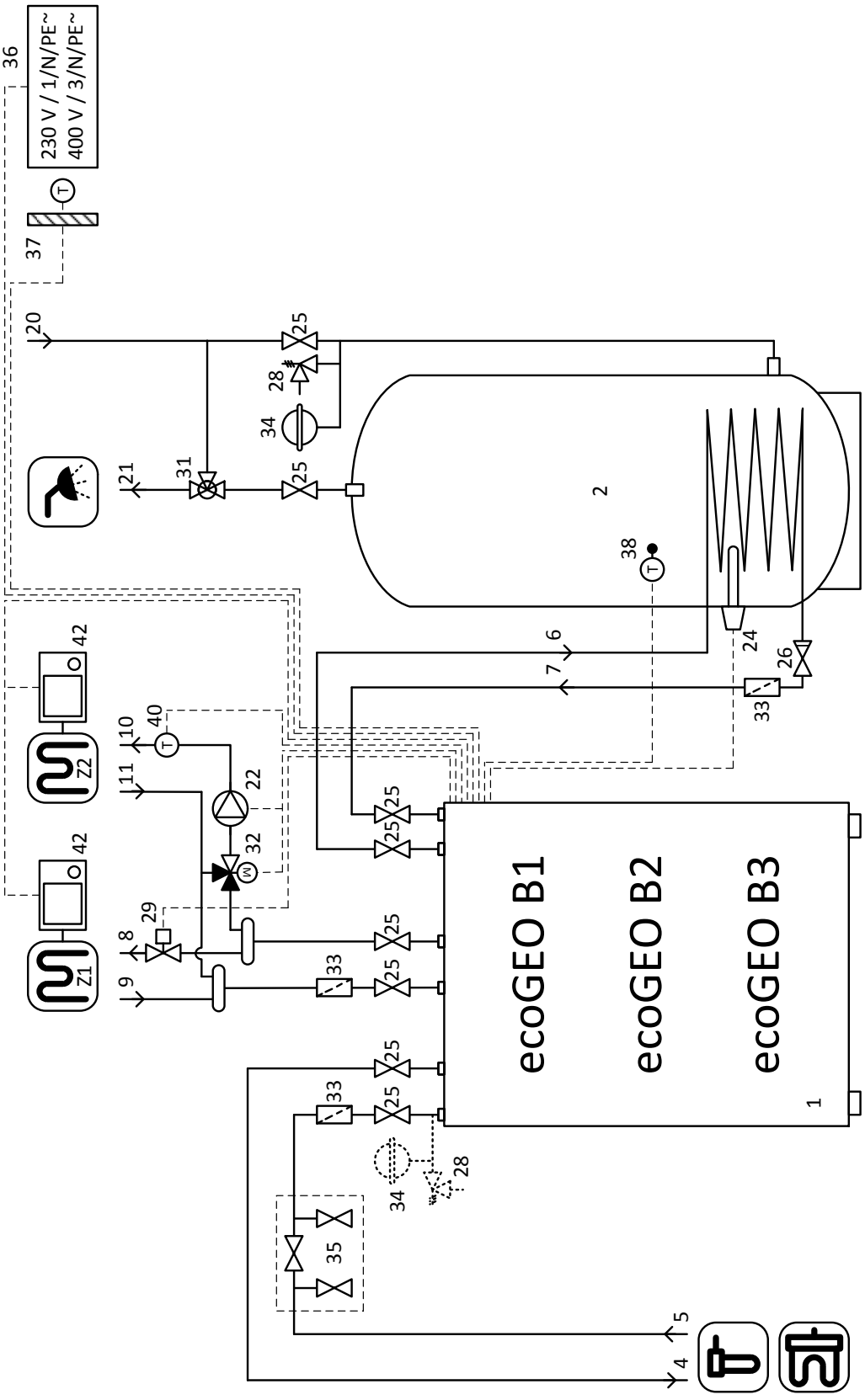
In addition to the own control equipments of the heat pump, it is necessary the installation of the following components (see section 7).

- An indoor th-Tune climate terminal (only in case the heat pump control is done through a th-Tune terminal). Supplied with the heat pump.
- One or more relay type thermostats for indoor temperature control (only in case the heat pump control is done through a signal from the relay type thermostats).
- A temperature probe for outdoor temperature. Supplied with the heat pump.
- A 3-way deviation valve to heating/cooling system.

■ NOTES

- Depending on the control system for climate control it may be necessary additional hydraulic components to guarantee the flow circulation through the heat pump (see section 6.1).
- The 3-way deviation valve to heating/cooling system may be activated by the connection terminal of the cycle reversing valve.

14.5. INSTALLATION IN 2 ZONE FOR ECOGEO B1, B2 AND B3



■ OPERATION

DHW Mode. Whenever DHW is demanded, the heat pump delivers hot water into the DHW inter-buffer heating coil until the temperature set point is reached (Maximum buffer temperature 50 ºC). In ecoGEO B1 and B2 models the hot water flow from the condenser is diverted to the inter-buffer heating coil through the 3-way valve heating/DHW. In ecoGEO B3 models the CHW system (Closed Hot Water production system) is activated and it allows the simultaneous supply of DHW and climate control. The heat pump always gives priority to DHW supply over other demands.

HEATING Mode. The heat pump directly delivers hot water to the heating system Zone 1 (high temperature zone) depending on demand. Zone 2 supply temperature (low temperature zone) is obtained mixing the heat pump supply flow with the return flow of the low temperature release system through the external shunt group. Supply temperatures to both zones are optimized according to outdoor and indoor temperatures and the configuration of values in the climate control. In case there is only a heating demand in Zone 2, the valve in Zone 1 will close to avoid water circulation in this zone and the heat pump will deliver directly to the set temperature in Zone 2 to optimize its efficiency. In case of exclusive demand of heating in Zone 1, the 3-way valve of the external shunt group closes the flow circulation in Zone 2 (position 100% bypass). Circulation pumps control the temperature range in supply and return in the brine and heating-cooling circuits between 3 and 5 ºC, respectively.

FREE COOLING Mode (ecoGEO B2 models). The compressor turns off, the circulation pumps are 100% active and heating-cooling and brine circuits are diverted to the free cooling heat exchanger. Thus, the equipment directly pumps out cool water obtained through the thermal exchange with the antifreeze mixture of the brine system.

ACTIVE COOLING Mode (only ecoGEO B3 models). The heat pump reverses its operational cycle, so that it directly pumps out cold water to Zone 1 (low temperature zone) of the climate control system. The supply temperature in Zone 2 (high temperature zone) is reached mixing the heat pump supply flow with the return flow of the low temperature release system through the external shunt group. The temperature set value of supply depends on the release system used in each zone. Circulation pumps control the temperature range in supply and return in the brine and heating-cooling circuits between 3 and ºC, respectively.

LEGIONELLA PROTECTION Mode. If the LEGIONELLA PROTECTION mode is enabled, one a week, on the date and time set, the anti-legionella resistance placed in the DHW tank will be activated to increase its temperature up to 70 ºC in order to avoid legionella contamination.

■ EXTERNAL CONTROL ELEMENTS

In addition to the own control equipments of the heat pump, it is necessary the installation of the following components (see section 7).

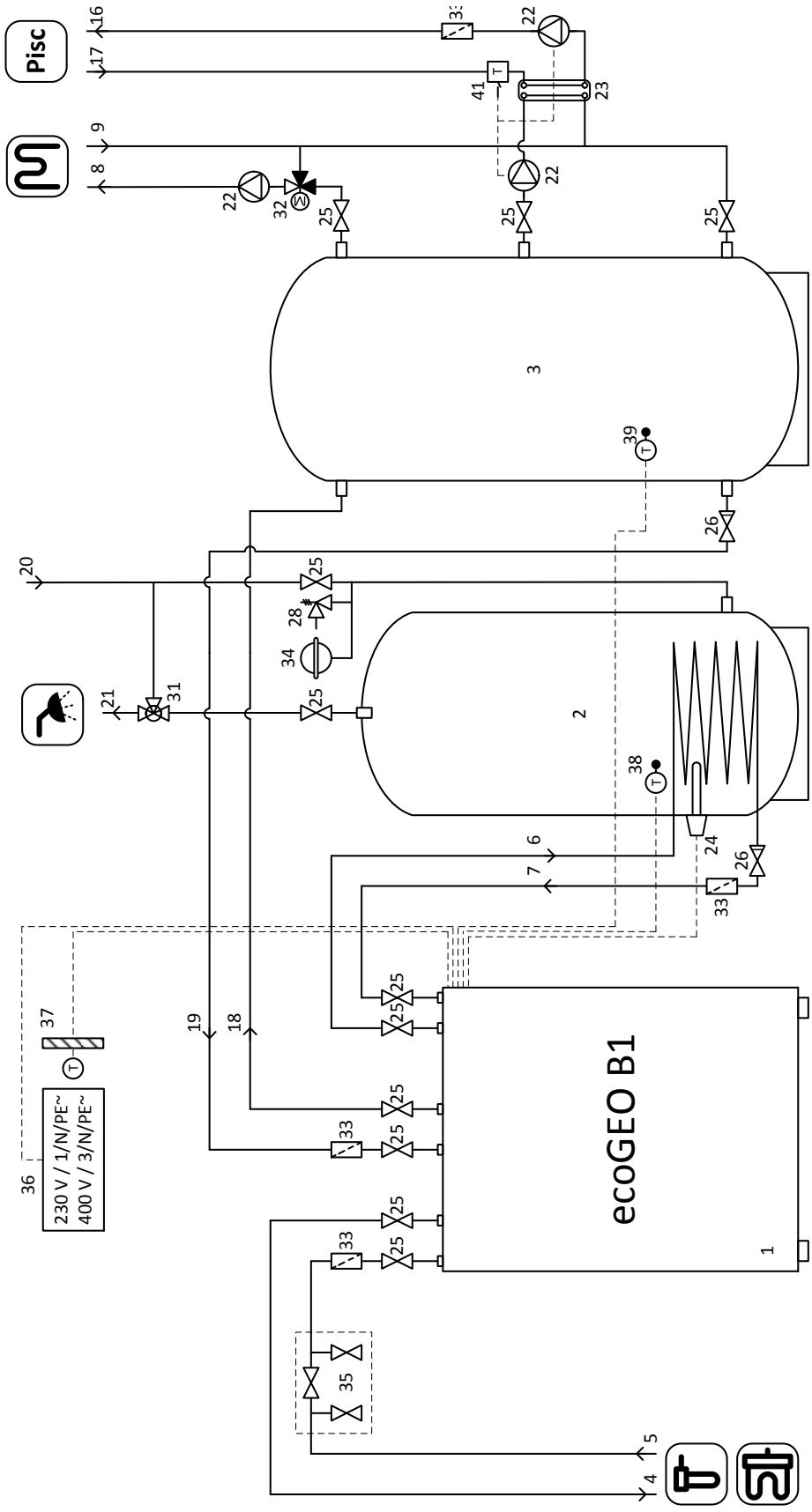
- An indoor th-Tune climate terminal to control Zone 1 (only in case the heat pump control is done through a th-Tune terminal). Supplied with the heat pump.
- An indoor th-Tune climate terminal to control Zone 2 (only in case the heat pump control is done through a th-Tune terminal).
- One or more relay type thermostats for indoor temperature control in Zone 1 (only in case the heat pump control is done through a signal from the relay type thermostats).
- One or more relay type thermostats for indoor temperature control in Zone 2 (only in case the heat pump control is done through a signal from the relay type thermostats).
- A temperature probe for outdoor temperature. Supplied with the heat pump.
- A temperature probe for supply in Zone 2.
- An external shunt group (pump + 0-10 Vdc 3-way modulating valve).

- A 2-way zone valve for Zone 1.

■ **NOTES**

- Depending on the control system for climate control it may be necessary additional hydraulic components to guarantee the flow circulation through the heat pump (see section 6.1).

14.6. INSTALLATION WITH INTERMEDIATE BUFFER TANK FOR ECOGEO B1



■ OPERATION

DHW Mode. Whenever DHW is demanded, the heat pump delivers hot water into the DHW inter-buffer heating coil through the 3-way valve for heating/DHW until the preset value temperature is reached. The heat pump always gives priority to DHW supply over other demands.

HEATING Mode. The heat pump satisfies the heat demand in the buffer tank. The supply temperature desired is set by the desired temperature value selected through the HEATING menu. Thus, the heat pump optimizes its energy efficiency and a uniform temperature in the buffer tank is reached.

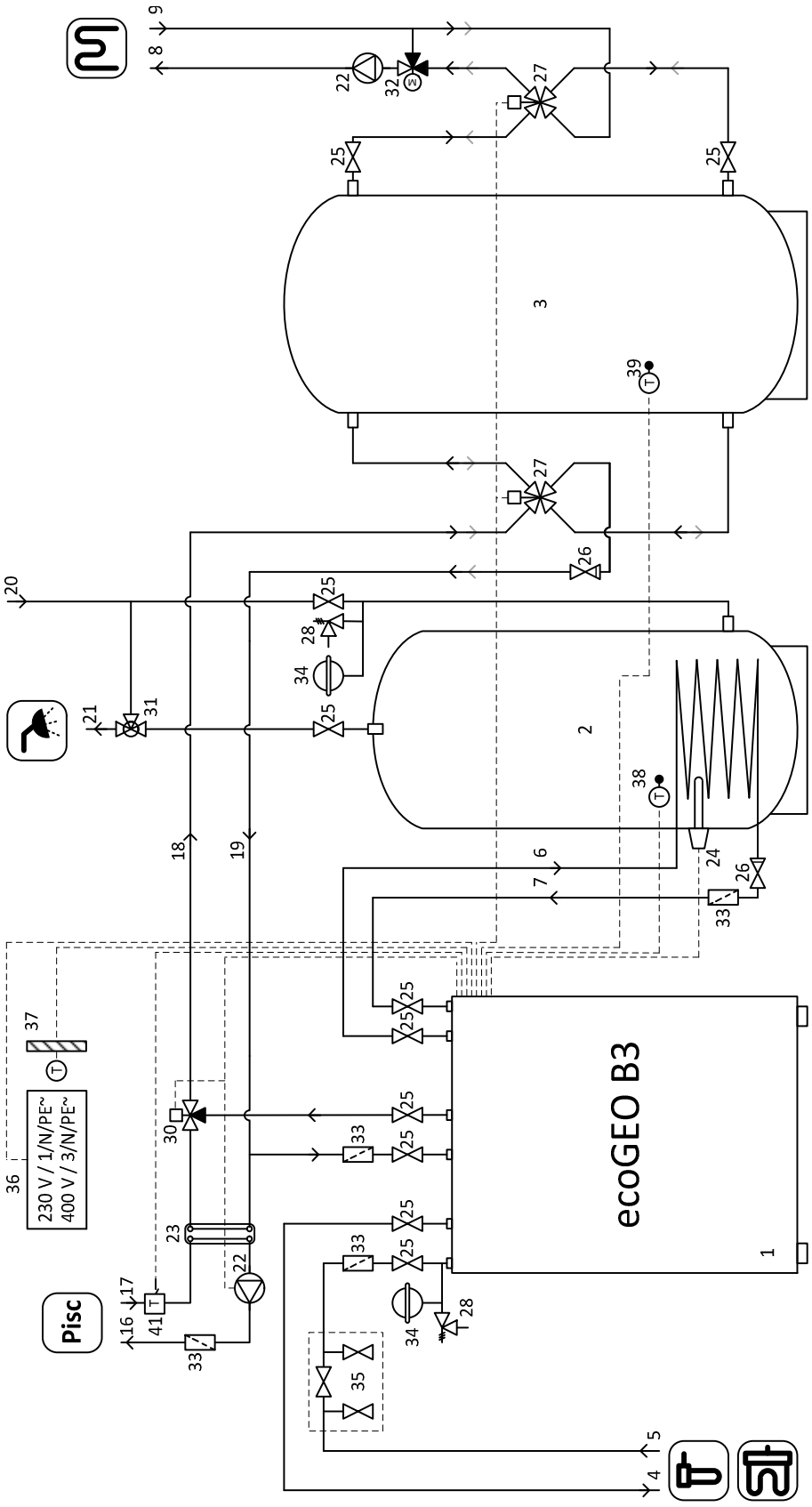
LEGIONELLA PROTECTION Mode. If the LEGIONELLA PROTECTION mode is enabled, one a week, on the date and time set, the electric heater placed in the DHW tank will be activated to increase its temperature up to 70 ºC in order to avoid legionella contamination.

■ EXTERNAL CONTROL ELEMENTS

In addition to the own control equipments of the heat pump, it is necessary the installation of the following components (see section 7).

- A temperature probe for the buffer tank. Supplied with the heat pump.
- A temperature probe for outdoor temperature. Supplied with the heat pump.

14.7. INSTALLATION WITH INTERMEDIATE BUFFER TANK AND POOL FOR ECOGEO B3



OPERATION

DHW Mode. Whenever DHW is demanded, the heat pump delivers hot water into the DHW inter-buffer heating coil until the preset value temperature is reached through the activation of the CHW system (Closed Hot Water production system), which it allows the simultaneous supply of DHW and climate control. The heat pump always gives priority to DHW supply over other demands.

HEATING Mode. The heat pump satisfies the heat demand in the buffer tank. The supply temperature desired is set by the desired temperature value selected through the HEATING menu. Thus, the heat pump optimizes its energy efficiency and a uniform temperature in the buffer tank is reached.

ACTIVE COOLING Mode. The heat pump satisfies the cool demand in the buffer tank. The supply temperature desired is set by the desired temperature value selected through the ACTIVE COOLING menu.

POOL Mode. The heat pump directly delivers hot water to the pool heat exchanger, without passing through the buffer tank, acting on the pool 3-way deviation valve. The desired temperature supply is established by a preset value. Circulation pumps control the supply and return temperature range in the brine and heating-cooling circuits between 3 and 5 ºC, respectively. The pool demand is only satisfied if there are not DHW or climate control demands. Once started the POOL mode, no other heating-cooling demands will be satisfied until the preset minimum time of operation in the heat pump configuration has been passed.

LEGIONELLA PROTECTION Mode. If the LEGIONELLA PROTECTION mode is enabled, one a week, on the date and time set, the electric heater placed in the DHW tank will be activated to increase its temperature up to 70 ºC in order to avoid legionella contamination.

EXTERNAL CONTROL ELEMENTS

In addition to the own control equipments of the heat pump, it is necessary the installation of the following components (see section 7).

- A temperature probe for the buffer tank. Supplied with the heat pump.
- A temperature probe for outdoor temperature. Supplied with the heat pump.
- A chrono-thermostat to active the POOL mode.
- A 3-way deviation valve to the pool heat exchanger.
- Two 4-way deviation valve for the commutation of supply and return pipes in both sides of the buffer tank.

NOTES

- The commutation valves in the supply and return pipes can be activated by the connection terminal in the reversing valve.

15. GUARANTEE

Ecoferest Geotérmia (ECOFOREST) guarantees this product for 2 (two) years from the date of purchase in case of manufacturing and material defects. Additionally, the compressor and inverter guarantees are extended to 4 (four) years and the DHW buffer tank in ecoGEO B1, B2, B3 models is extended to 5 (five) years from the date of purchase.

ECOFOREST liabilities are limited to the equipment supply, which must be properly installed, following the instructions given in the publications delivered when purchasing the product and in accordance with the law in force.

The equipment installation must be performed by authorized personnel, who will assume all liabilities concerned with the final installation and the associated proper functioning of the product. ECOFOREST does not accept any liability in case these precautions are not taken. Installations accomplished in public premises will be submitted to the local specific regulations.

It is essential to conduct a test run of the equipment before the installation is completed.

ECOFOREST ensures that all its products are manufactured using the highest quality materials and manufacturing techniques that guarantee their best efficiency.

If during normal usage defective or damaged parts are detected, the replacement of these parts will be carried out free of charge by the distributor who has formalized the sale or the seller of the corresponding area.

For products sold abroad, said replacement will be also free of charge and always will be made in our establishment, except when special agreements have been made with one of our distributors abroad.

■ CONDITIONS AND GUARANTEE VALIDITY

In order to accept the validity of this guarantee, the following conditions must be met:

- The buyer must send the guarantee sheet and a copy of the invoice or the delivery note within 30 (thirty) days from the date of purchase. The seller must confirm the date of purchase and own a valid tax document.
- The installation and setup of the product must be always performed by the authorized technical staff who considers that the installation technical specifications to connect the equipment are suitable. Said installation must comply with the specifications given by the users and installer's manual and delivered with the product.
- The equipment must be always used as indicated in the users and installation manual delivered with the product.

This guarantee does not cover damage caused by:

- Atmospheric agents, chemical agents and/or misuse of the product, lack of maintenance, undue modifications or tampering of the equipment or any other causes that are not dependent on the product.
- Improper transportation of the product. It is advised to thoroughly review products on receipt and, in case any damages are detected, to contact immediately the seller and write down the faults on the transport delivery note, including the carrier's copy. You have 24 (twenty four) hours to submit your written claim to your distributor and/or carrier
- Return of products will only be accepted if it has been previously agreed in writing by ECOFOREST, the products is in perfect conditions and returned with its original packing and a

copy of the delivery note and invoice, if any, carriage paid, as well as a letter accepting this conditions.

- All parts subject to wear are excluded from this guarantee, except in case of manufacturing defects.
- All installation components not supplied by ECOFOREST as well as its configuration for installation are not included in this guarantee.
- Brickwork and plumbing needed for the equipment installation are excluded from this guarantee.
- This guarantee is only valid for the buyer and cannot be transferred.
- Replacement of parts does not extend the equipment guarantee.
- Compensations based on equipment inefficiency derived from a wrong sizing of installation will not be paid.
- This is the only valid guarantee and no one is authorized to issue other on behalf of or in the name of ECOFOREST.
- ECOFOREST will not pay any compensation for direct or indirect damages caused by the product or derived from it.

Intervention requests must be submitted through the establishment where the product was bought.

ECOFOREST reserves the right to include any modifications in its manuals, guarantees and rates without the need for notification.

Any suggestions and/or claims must be sent in writing to:

ECOFOREST GEOTERMIA, S.L.

Poligono industrial A pasaxe C/15 - nº22 - parcela 139

36316 - Vincios / Gondomar - Pontevedra (España)

Tlfs.: +34 986 262 184 / +34 986 417 700

Fax: +34 986 262 186

e-mail: Info@ecoforest.es

http://www.ecoforest.es

Information to be included in suggestions or claims:

Supplier’s name and address

Installer’s name, address and pone.

Buyer’s name, address and phone.

Invoice and/or delivery note.

Equipment installation and first start-up dates.

Equipment serial number and model.

Regular control, revisions and maintenance duly stamped by the distributor.

With regard to your requests, please make sure that your explanations are clear and provide any information you may consider important to avoid misunderstandings.

Interventions during the period of guarantee include the equipment repair free of charge in accordance with the law in force.

■ **JURISDICTION**

Both parts, just for the sake of making and accepting orders, are submitted to the jurisdiction of Courts and Tribunals of Vigo, expressly waiving any other rights that may be entitled to, including the case of debit payments due in other Spanish cities or foreign countries.

16. DECLARATIONS OF CONFORMITY

DECLARACIÓN "CE" DE CONFORMIDAD DE ACUERDO CON DIRECTIVA DE MÁQUINAS 2006/42/CE

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ECOFOREST GEOTERMIA S.L.

P.I. A PASAXE CALLE 15 – Nº22, PARCELA 139
36316 – VINCIOS – GONDOMAR
PONTEVEDRA – ESPAÑA
Correo electrónico: geotermia@ecoforest.es

Declara que, en cumplimiento con la directiva 2006/42/CE, el producto que se detalla a continuación ha sido diseñado y fabricado siguiendo los procedimientos en ella establecidos.

Descripción del producto:	**BOMBA DE CALOR GEOTÉRMICA**
Modelo:	**ecoGEO B1**
Medidas totales:	**1.000 x 600 x 700 mm**
Potencia:	**3-12 kW**
Año de fabricación:	**2012**
Directivas de cumplimiento:	**2006/42/CE; 2006/95/CE y 2004/108/CE**

Notas relativas al producto

La documentación relativa a este proyecto se encuentra disponible en nuestra sede para su control eventual.

Cargo: Dtor. General

Fecha: 23/04/2012

Firma:

ecoFOREST
Ecoforest Geotermia, S.L.
B-27767433
Polígono Industrial A Pasaxe,
Calle 15, nº 22, Parcela 139
36316 Vincios / GONDOMAR
TL-34-986262184
Fax:34-986262186

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Descripción del producto:	**BOMBA DE CALOR GEOTÉRMICA**
Modelo:	**ecoGEO B1**
Medidas totales:	**1.000 x 600 x 700 mm**
Potencia:	**5-22 kW**
Año de fabricación:	**2012**
Directivas de cumplimiento:	**2006/42/CE; 2006/95/CE y 2004/108/CE**

Notas relativas al producto

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Descripción del producto:	**BOMBA DE CALOR GEOTÉRMICA**
Modelo:	**ecoGEO B2**
Medidas totales:	**1.000 x 600 x 700 mm**
Potencia:	**3-12 kW**
Año de fabricación:	**2012**
Directivas de cumplimiento:	**2006/42/CE; 2006/95/CE y 2004/108/CE**

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Descripción del producto:	**BOMBA DE CALOR GEOTÉRMICA**
Modelo:	**ecoGEO B2**
Medidas totales:	**1.000 x 600 x 700 mm**
Potencia:	**5-22 kW**
Año de fabricación:	**2012**
Directivas de cumplimiento:	**2006/42/CE; 2006/95/CE y 2004/108/CE**

Notas relativas al producto

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Descripción del producto:	**BOMBA DE CALOR GEOTÉRMICA**
Modelo:	**ecoGEO B3**
Medidas totales:	**1.000 x 600 x 700 mm**
Potencia:	**3-12 kW**
Año de fabricación:	**2012**
Directivas de cumplimiento:	**2006/42/CE; 2006/95/CE y 2004/108/CE**

Notas relativas al producto

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Descripción del producto:	**BOMBA DE CALOR GEOTÉRMICA**
Modelo:	**ecoGEO B3**
Medidas totales:	**1.000 x 600 x 700 mm**
Potencia:	**5-22 kW**
Año de fabricación:	**2012**
Directivas de cumplimiento:	**2006/42/CE; 2006/95/CE y 2004/108/CE**

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